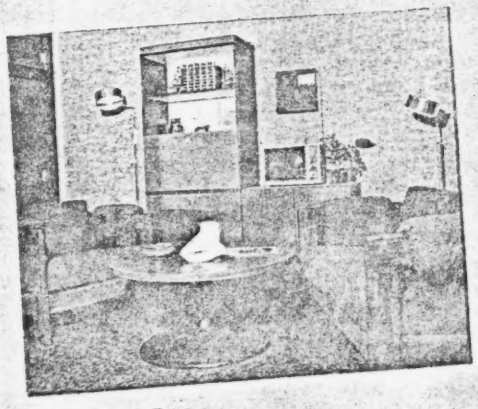
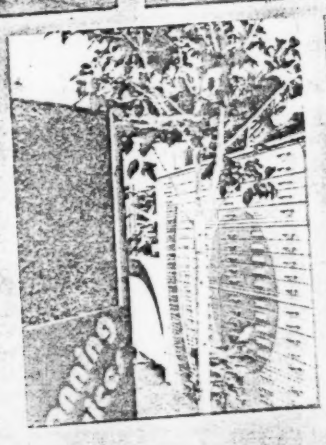
VOL 17 NO 1 FEBRUARY 1976

AIR FORCE engineering & services QUARTERLY

Interior Design



with People in Mind



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Maj Gen Robert C. Thompson
Director
Engineering & Services

From the Director

BMAG: Search for a better tomorrow

Gen David C. Jones, Air Force Chief of Staff, has established an action group under my leadership to develop initiatives necessary to insure that base level functions continue to operate effectively within the future fiscal environment. The objective is to determine ways to improve upon present organization, procedures, functions and policies, where possible, and at the same time, to realize savings in money, material and people.

The Base Management Action Group (BMAG) has been charged to seek out innovations in the way we do business at base level to meet the challenges of increasing personnel costs and budget constraints—while maintaining operational readiness and quality of life. The focus is on operations and maintenance and manpower costs in the area of base operating services.

The scope of the BMAG effort transcends any functional area identification. It is composed of full time duty members drawn from the Air Staff as well as Major Commands.

We are working across the Air Force with responsible leadership, seeking to make our present base management better.

Base management is a fruitful area of inquiry. Points of contact have been designated in the MAJCOMs and MAJCOM representatives are participating as members of the BMAG team. In addition, we will keep a running MAJCOM awareness of, and informal coordination on, major areas under consideration to facilitate implementation of the initiatives that come out of the BMAG activity.

Because BMAG actions will involve organizations and daily tasks at all levels, ideas are solicited from every level in any format. I visualize first priority on near term opportunities that do not require testing. We also are working on initiatives that require some testing and longer range implementation. Key criteria for analysis of initiatives are: Is the proposal identifiable, practical, constructive? What initiatives will save the most money and offer reasonably fast payback? Which ones are most cost-effective, most attractive from cost-benefit analysis? What are the projected long range gains? What timing is required to achieve results in implementation? What are the visibility opportunities? And what are the key assumptions?

We have several projects underway. However, we are still searching for new ideas—innovations—solutions. The success of this important undertaking requires marshaling the best thinking across the Air Force. It is dependent on the collective abilities of all of us. It provides an opportunity for a significant contribution to the Air Force in finding better ways to meet contemporary internal and external challenges. Your ideas and proposals are welcome at all times. You can mail them to:
HQ USAF (BMAG)
Washington DC 20330
or phone: AUTOVON 297-4865 or Commercial (202) 767-4865.

Robert C. Thompson

ROBERT C. THOMPSON
Major General, US Air Force
Director of Engineering and Services

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QUARTERLY

USAF Recurring Publication CE 85-1

Vol 17, No 1, February 1976

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DISTRIBUTION: F. The Quarterly's annual subscription prices are: $3.00 domestic; $3.75 foreign; 75 cents per copy. Mail check or money order to Superintendent of Documents, Government Printing Office, Washington DC 20402.

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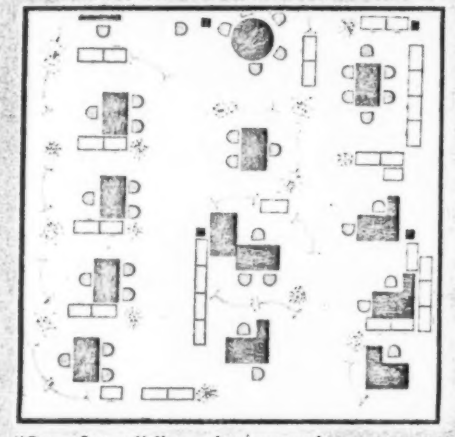
AMERICAN REVOLUTION BICENTENNIAL 1776-1976 ™

Address Mail: Editor, Air Force Engineering & Services Quarterly, AFIT-DEJ, Wright-Patterson AFB, OH 45433

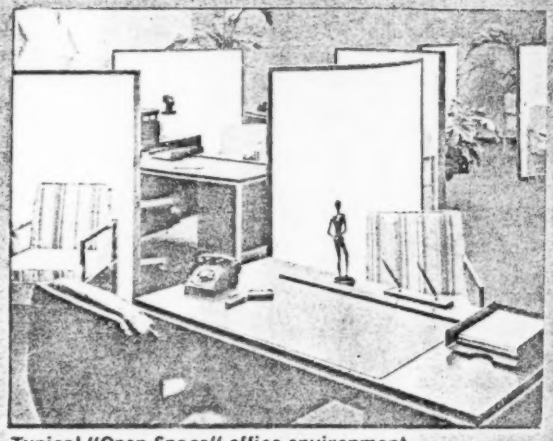
The time to move away from environmental sterility to environmental creativity is now! An open landscaped environment which makes use of colorful free standing, fabric covered partitions; carpeting; accent colors; and contemporary furniture are examples of what can be done.

Interior Design with People Satisfaction in Mind

by William A. Brown, Sr



"Open Space" floor plan concept.

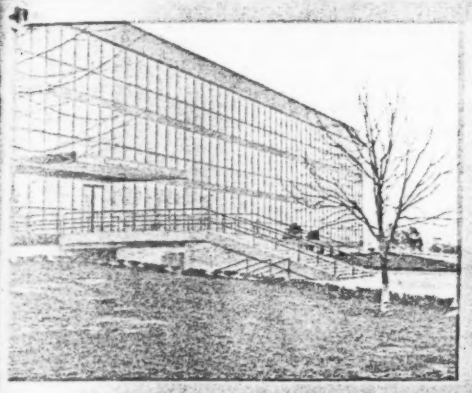


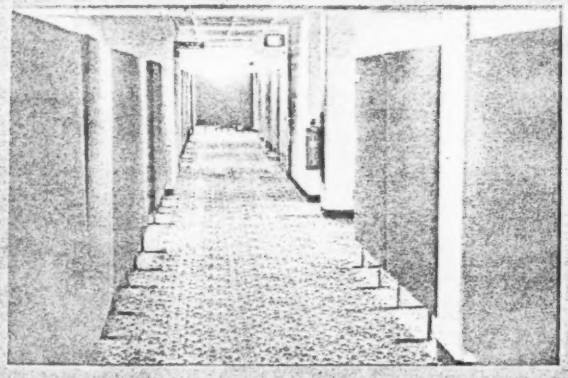
Typical "Open Space" office environment.

An increasing concern exists over the need to improve the quality of facilities throughout the Federal government. As a result, design assemblies and workshops are being conducted, bringing together building managers, designers, and occupants (who are working) to insure that psychological as well as physical considerations are incorporated into projects. Much of their discussions and concerns focus on the need to improve the quality of the interior environment or the "livability" of an environment. A simple environmental assessment of where one "lives" during the majority of the work day pinpoints the need to improve the quality of the work environment by placing greater emphasis on interior design.

Good interior designs are developed during the building design process in order to obtain interior and exterior compatibility. Most of all, good interior designs are developed for "people." How people react to certain finishes, how people work, how people maintain their environment, and how people are motivated are some of the many factors which interior designers consider prior to developing schemes. Once the scheme has been developed and implemented, the result is generally greater "people" satisfaction.

An example of a facility where early attention by the Commander resulted in an outstanding interior environment is the new 90,000 square foot Headquarters Command (HQ COMD) building at Bolling AFB, Washington DC which was completed in 1975. At the request of the Commander of HQ COMD, the Director of Engineering and Services tasked his staff to work with the command to assure that a "people oriented" environment was developed. The result is an open landscaped environment which makes extensive use of colorful free standing, fabric covered, low height partitions; carpeting throughout; accent colors in the stairwells and lobbies; and new contemporary furniture in select locations. This is one example of what can be done. With limited resources, engineers cannot afford to wait until

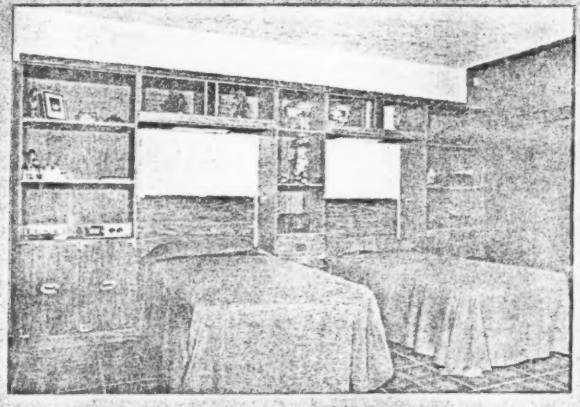




FAR LEFT: Main entry to Headquarters Command Building, Bolling AFB.

LEFT: Patterned carpet and fabric covered partitions adorn a corridor.

Proposed interior of a two man dormitory room. Note that floor and wall coverings are color matched.



Sleeping area of proposed two man dormitory room features modern furnishings.

post construction to accomplish interior design. Plans must be initiated at the beginning of a project in order to obtain an attractive environment at a minimum cost. **Designers** and **commanders** must take the initiative and give more than "lip service" if they expect people to be pleased and proud of their environments.

The following discussion on the major elements of an interior scheme for administrative facilities provides insight into major areas of consideration.

FLOOR COVERINGS

Durability, ease of maintenance, aesthetics of the functional area, fire resistance, and aesthetic appeal and enhancement of the interior are major considerations when selecting floor coverings. Of all the various types of floor coverings available, carpeting provides a feeling of warmth as no other floor covering does. It enhances the quality of interior design, serves to de-institutionalize areas, reduces reflected glare and reduces noise. All of these elements along with the color and texture of the carpet, give a room a much greater psychological feeling of warmth.

In most cases, Air Force policy requires the use of patterned carpet. The advantages in the use of patterned carpet are varied. Some of the more significant include:

- The ability to hide soil. Soil tends to merge into the design and is not as noticeable as soil on tweed or solid colored carpet.
- The ability to stimulate people. Because of the variety of designs available, patterned carpets allow the designer to create lively interiors that motivate people to be more productive.
- Appeals to both contemporary and traditional tastes.
- Leads to additional interior decoration.

Patterns not only brighten the floor, but they also lead to the use of more colors on the wall. Because patterned carpets are multi-colored, the designer has a choice of several colors in the carpet which can be used on wall surfaces. The colors in the pattern also suggest types of

fabrics; colors for upholstery and for draperies; and colors of furniture. Examples of patterns which lend themselves to use in a variety of facilities are shown in this article. Recent guidance issued by the Directorate of Engineering and Services, Headquarters US Air Force, contains a list of patterned carpet available through the General Services Administration (GSA) and commercial sources. Intensified efforts are underway to obtain changes to the Department of Defense Construction Criteria which would allow greater use of carpet.

Other types of attractive floor coverings available include vinyl asbestos floor tile, the most commonly used floor covering. It is available in a variety of surface finishes that can be used to create a warm, interesting and stimulating environment but not to the extent of carpet.

WALL FINISHES

Finishes should be selected based on durability, low maintenance, fire requirements, aesthetic appeal and suitability for functional area. Good interior decorating schemes use a variety of finishes to satisfy these requirements which create stimulating environments. Low cost finishes suitable for Air Force facilities use include: vinyl wall coverings, paneling, naturally finished materials such as brick, and paint. However, when selecting interior finishes, the use of naturally finished materials should be limited to main lobby areas where special effects are desired, unless economically justified. Other finishes are less expensive and lend themselves to use in most environments in the majority of Air Force facilities.

A good decorating scheme for the average office should include at least two different wall finishes. Three walls can be painted and one wall can be finished with a vinyl wall covering or paneling. The result is the creation of an interesting and stimulating atmosphere. Conversely, if all four walls of the same room were paneled or finished with vinyl wall covering, the result would be a sterile environment, one which lacked interest and creativity. Research has shown that people tend to tire and become indifferent in a sterile environment. On the other hand, colorful interiors make people aware of, and a part of, the environment by inspiring interest rather than causing a mood of boredom. The result is greater employee satisfaction and productivity.

Paint, of all the low cost wall finishes, with its wide variety of colors, is effective yet relatively inexpensive to apply and maintain. A good scheme will take into account the following factors:

• People often judge colors in emotional terms. Those with outgoing personalities like strong colors such as red or orange. People with reserved personalities like cool colors such as green or blue. **Therefore, it is safe to assume that any successfully designed interior must combine the use of strong and reserved colors.**

• Strong colors should be used as accent colors to add interest and highlight special areas. Each work area, office, etc., should have at least one wall painted in an accent color. Entry ways, stairwells and all public spaces should also be highlighted through the use of accent colors.

• Major colors used throughout an area should be chosen from colors contained in the floor covering or complementary colors.

• Color selection should be made early in the design process in order to assure compatibility with furnishings.

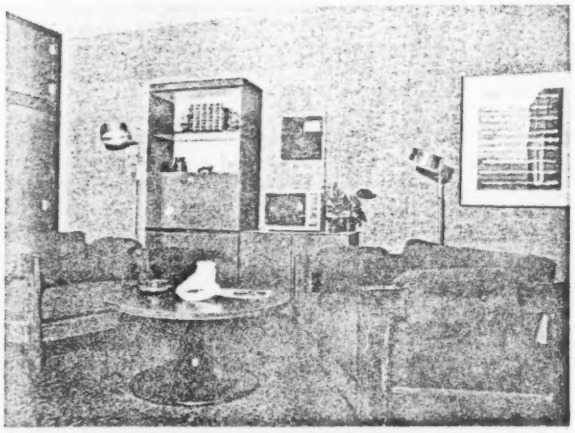
• Architects and other design oriented personnel should be consulted on color selection.

WILLIAM BROWN *is an Architect in the Structures Branch, Engineering Division, Directorate of Engineering and Services, Headquarters US Air Force. He is a graduate of Hampton Institute, Hampton, Virginia, with a bachelor's degree in architectural engineering. He is an associate member of the American Institute of Architects and the Society of American Military Engineers.*

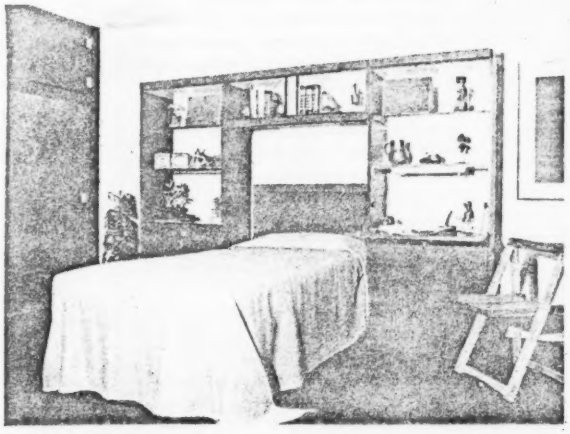
FURNISHINGS

Just as care must be exercised when selecting floor coverings and wall colors, the same amount of attention must be given to the selection of furnishings. The new line of office excellence furniture available through GSA offers the designer an opportunity to use contemporary office furniture to create a modern environment. While furniture colors have been restricted to black or parchment, these basic colors are quite appealing when placed in a colorful environment.

Where funds do not permit and a different but equally attractive environment is desired, GSA has developed an electro-static paint process. This is performed by a contractor who will refinish existing furniture in place. This process allows a designer the opportunity to color coordinate furniture with the walls, floor covering, etc. Areas can be defined by using brightly colored furniture, such as file cabinets, painted a bright accent color and arranged so visual privacy can be obtained around a worker's desk where floor to ceiling partitions would normally be used. This concept of using furnishings and/or low height partitions to define work areas is called "open



Sitting room area of a proposed one man dormitory room. Furnishings create a modern environment.

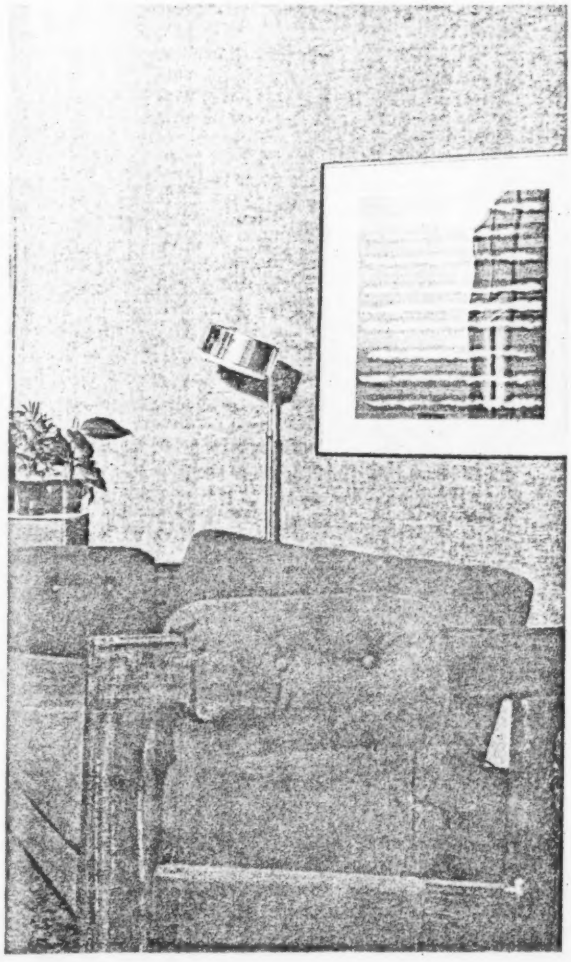


Sleeping area of a proposed one man dormitory room offers the versatility of color and modern furniture.

space" planning. One of the major advantages of using this concept is "designed-in flexibility" allowing for rearrangement of office spaces at any time without any change to the building.

Attractive low height partitions are also available through GSA. These fabric-finished partitions come in a variety of colors, sizes and shapes. In most office environments, partitions which are raised at least six to eight inches from the floor should be used. These allow easy access for floor maintenance.

Good interior design will incorporate the considerations discussed into schemes which provide a stimulating and creative environment for **people.** Emphasis is being placed throughout Air Force Engineering and Services on this aspect of design in order to assure that we create dynamic environments. Interior design schemes have been developed for the new Air Force Accounting and Finance Center at Lowry AFB, Colorado; the new chapel at Andrews AFB, Maryland; and the new and existing dormitories at Bolling AFB, Washington DC. Interior design schemes are also being developed for most medical facilities. Policy guidance has been developed and will soon be distributed. The time to move away from **environmental sterility** and move toward **environmental creativity** through an effective interior design program is now. E&S



Advances in technology of office design are posing new challenges for Federal administrators. The key changes are not simply cosmetic. They promise to cut the life-cycle costs of building, furnishing, maintaining and operating an office.

New Approaches to Office Design

Recent advances in the technology of office design are posing new challenges for Federal administrators. Office greens and grays are giving way to sometimes startling splashes of color. But the key changes are not simply cosmetic. They promise to cut the life-cycle costs of building, furnishing, maintaining, and operating an office.

The major advances center on such elements as: • The "office landscape" concept. • New furniture for the work station. • Task lighting. • Access floors. • A new breed of designers. • The keen interest of top management.

When combined wisely, these elements benefit office workers, management, and the ecology at large. Among the benefits claimed for the new approaches are that they: • Spur productivity. • Improve communication and workflow. • Save floor space. • Expedite construction. • Reduce construction and maintenance costs. • Save energy. • Slash the cost of office moves and make them swift and easy.

The office landscape concept

An "office landscape" is not simply an "open" office. The "landscape" idea originated in Quickborn (near Hamburg), Germany. There, more than ten years ago, an interdisciplinary group of management consultants—The Quickborner Team—developed an approach to office design that hinges not on esthetics but on efficiency of communication.

Based on John Pile's excellent report (*Interiors*, January 1968), the original "landscape" concept was based on such observations as these:

• Lines of communication are the vital patterns in any organization. These patterns should be expressed in the placement of work stations.

• Patterns of communication can be discovered only by direct, pragmatic research. Reporting of *actual* communications, face-to-face, written, or telephoned, over a period of several weeks generates basic data that reveal real work patterns as distinguished from those supposed to exist.

Bold color, graphics, greenery and carpeting vitalize this 1850s building occupied by a division of the Navy Facilities Engineering Command.

• A chart of the density of communication can express relationships between individuals in small groups and relationships between groups. Much communication should lead to proximity, little communication to remoteness. Since density of communication does not consistently follow hierarchical or departmental patterns, plans based on these familiar guides will not lead to maximum efficiency.

• Huge, unbroken areas of simple, near-square shape are ideal for office landscape planning. Irregular spaces can be used but at a cost of some compromise with the ideal.

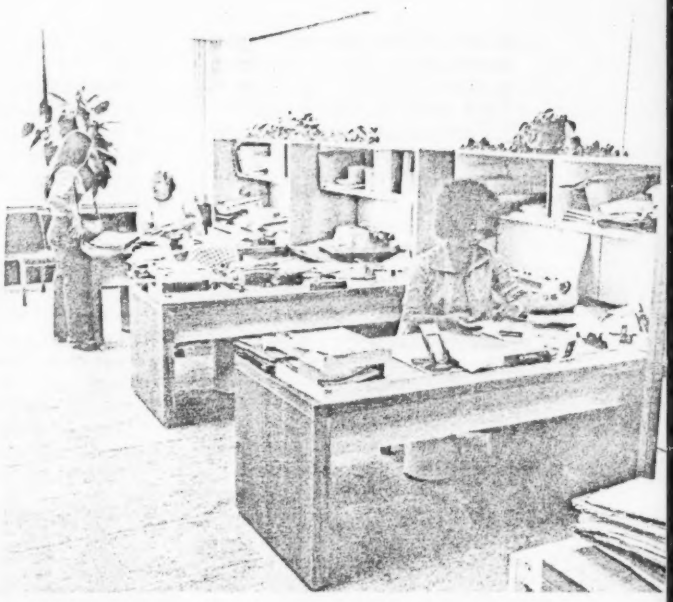
• Partitions tend to establish communication barriers, and they limit flexibility. Even moveable partitions are some trouble to move.

• The commonly accepted requirements for privacy are greatly exaggerated. Where privacy is required for confidential meetings, it can be better achieved through the use of special spaces.

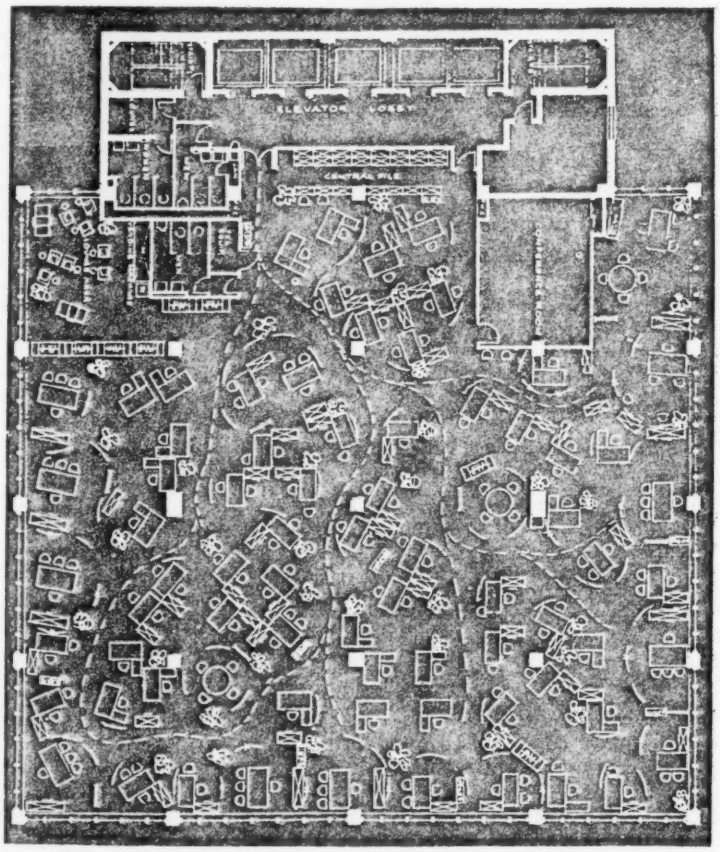
• Carpeting of all floors plus acoustical ceilings brings the background noise down to a level that helps to make acoustical privacy possible without walls. Where the ambient noise level is too low, it may be desirable to *add* "white" noise through the air-conditioning system or a wired sound system. Furniture should be chosen to minimize hard, reflective vertical surfaces. Open bins and shelves for filing are preferable to cabinets for this reason.

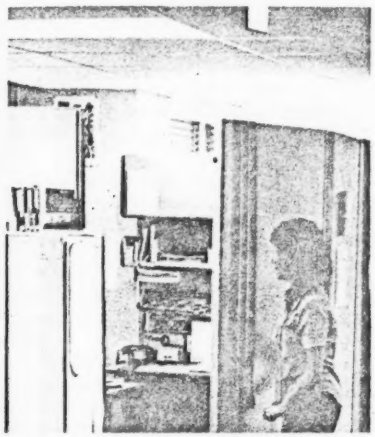
• Geometric arrangements of furniture and aisles limit the possibilities for placing work stations on the basis of

RIGHT: Secretarial work stations feature new lines of furniture. Almost everything is in easy reach.



BELOW: Contemporary filing cabinet tops are landscaped with plants and greenery.





ABOVE: This office floor plan design harmonizes space, office furniture, partitions and greenery.

RIGHT: Partitions and greenery are a noticeable part of the open office landscape system in this building.

functional needs. Free, nongeometric patterns are more adaptable and avoid the chilling vistas of regimentation in large, open areas. (This dictum establishes the characteristic look of "office landscape" with its seemingly random patterns of scattered furniture groupings.)

• Limited privacy may be achieved through the use of light moveable screens and living plants.

• Rest areas for all staff members must be open for use at any time, and they must be large, comfortably furnished, and well provided with equipment for coffee and other refreshment.

• Files should be stored outside the working office insofar as possible. Only papers in actual use should be on the working floor, and they should be kept in open bins or carts.

Not everyone agrees with all of these "dicta," and over the years many of them have been refined by The Quickborner Team. And, since the "landscape" idea was conceived, many new developments (computer-assisted planning, work-station hardware, task lighting, access floors, and others) have reinforced or modified the original concept.

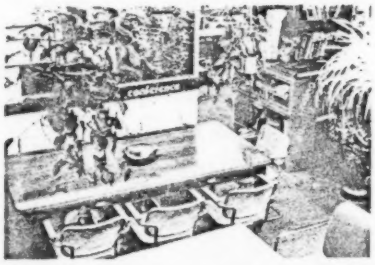
The "landscape" concept offers great benefits for firms and agencies that move or reshuffle their offices frequently. And the Federal Government is noted for that. A recent retiree reported that over the 35 years of her Federal career—with the same agency—her office moved on the average of once every two years.

Given the dynamics of the Federal Government, every Federal executive should be—or quickly become—aware of the pros and cons of the "landscape" approach to more efficient office operations. The "pros" are compelling. The "cons" center mainly on such problems as privacy, noise, and security, but these can usually be overcome by close analysis of the agency's real needs—and *very careful* planning.

New furniture for the work station

The "landscape" concept has prompted fresh approaches to the design of office furniture. In the past, the traditional desk has dominated office layout and imposed a sedentary regimen on the worker. The new approach is to design the furniture to fit the work rather than the work to fit the furniture.

Robert L. Propst, research director of Herman Miller, Inc., asks such questions as: Do you feel deskbound and sedentary? Is it difficult for you to keep track of all your responsibilities? Does your office allow you to display items meaningful to your work? Can you spread out paperwork and keep it out as long as you like? Do you have to take your hard-thinking tasks out of the office? Does your office invite access by the right people? Are you torn between keeping in touch and minimizing distraction? Do you have a place where you and another person can work comfortably side-by-side on a task that involves paperwork? Can you confer in your office with assured audible privacy? Can you have a private phone conversation while there is a visitor in your office? Can you display confidential papers and yet keep them suitably private? Do you have paper pileups and traumatic housecleanings? Is your office adaptable to change?



Color, graphics, plantings, carpeting and furnishings create a motivating work environment in this Navy Facilities Engineering Command office building.

The answers to such questions have led Propst to the design of new pieces of furniture that are as different from traditional ones as chessmen are from checkers. Speaking of the Propst-inspired Herman Miller "Action Office" (AO), *Interiors* reports that "The fact that it is different . . . is obvious at a glance. But . . . the difference is *basic*, not merely *visual* . . . It starts with . . . the problems of the modern office and endeavors to solve them systematically.

"AO frees the executive from a static sitting position: instead it provides him with a healthy choice—to sit, to stand, or to perch and lean at barstool height—and it allows him to change position at will.

"AO also frees him from the "ideal" of the clear desk top, under which . . . papers are hidden in . . . drawers; instead it provides files recessed in the desk top . . . for information he is currently using, and it also enables him to cover his . . . papers—without disturbing . . . them—with a rolltop. . . .

"Propst, operating on the axiom that out of sight is out of mind, . . . finds that . . . the office worker also needs display space and visual triggers . . . to remind him of what he is supposed to be doing. Propst also feels that the tidy desk top is a waste of time. Rolltops or pullover desk covers enable the worker to cover his project at five o'clock. . . .

"The ideal office . . . is an open-sided arena where the user can . . . encourage or discourage visitors by facing the wall or the door."

The "Action Office" is only one of many "new" office systems now on the market. These are in addition to the brightened-up traditional desks and a new line of colorful screens now offered by the Federal Supply Service and by many other "old line" sources.

Task lighting

"Task lighting" is an exciting new concept in office design. The idea is to build "task" and general lighting into the "woodwork" of office furniture. Fixtures hidden in the work station focus just the right volume of light down onto work surfaces and bounce the rest off the ceiling to brighten the general area. If more lighting is needed, it is provided by free-standing "street" lights.

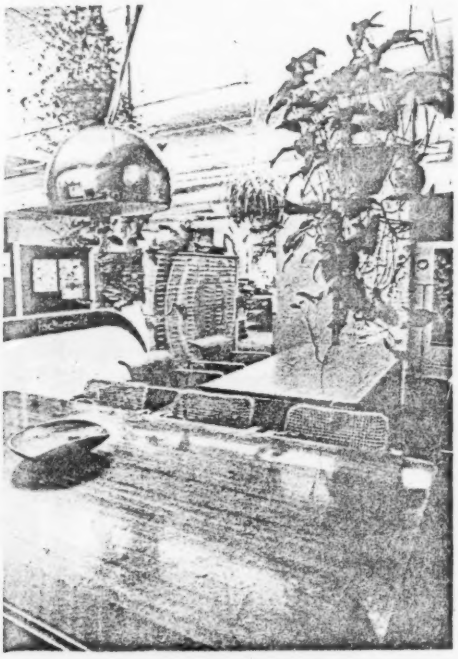
Jeff Miller of Hunter/Miller + Associates reports that "Task lighting cuts energy use in the office by more than 30%. For each square foot of office space, the old guidelines typically assign: 5 watts for lighting. 5 watts for air conditioning. 2 watts for other services.

"Task lighting cuts the lighting load in half—to 2.5 watts per square foot. Since 50% of the air conditioning is needed to offset heat from lamps, a 50% drop in the lighting loads cuts the air-conditioning load by 25%. This yields another saving of 1.25 watts per square foot. The total saving comes to 3.75 watts—or better than 30%."

Richard Thomas of Knoll International notes that task lighting also: • Helps staff members to focus on their work. • Speeds and lowers the costs of construction, alterations, and maintenance. • Improves acoustics and fire protection.

Access floors

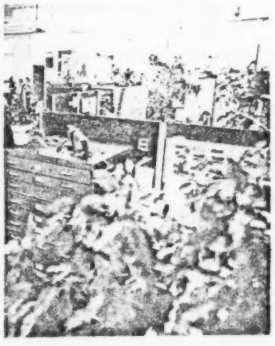
Administrative Management (June 1975) reports that a "new type of flooring has begun to appear in offices. Called the . . . access floor, it consists of square units on pedestals that raise it a few inches or more from the struc-

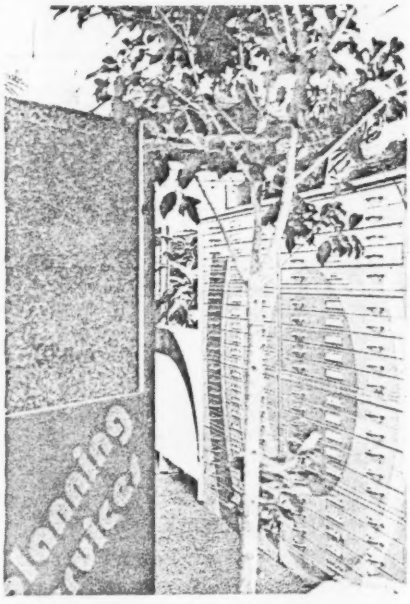


LEFT: This conference room features a blend of furniture available from GSA, and plantings and bold graphics.

CENTER: The mixture of partitions, furniture and plantings in this office area creates a motivating environment.

RIGHT: Colorful, bold graphics transpose a drab filing cabinet into an unusual piece of artwork.





LEFT: This secretarial work area features what is termed open space landscape office system.

tural slab. The . . . floor covering can be any type . . . Today a growing percentage is carpeting.

"Access floors were first used in computer rooms. For general office use, they were overdesigned and overpriced. But new . . . lighter weight systems and higher volume of production have lowered the cost.

"Access flooring saves some construction costs . . . the structure can be finished sooner . . . and . . . alterations are cheaper. . . . Access floors have unique fire safety qualities . . . since all services rest on top of the solid slab. . . . However, . . . access flooring is generally economical only if office facilities use a lot of power channels and if there are many office changes. . . .

"Another kind of under the floor power system is the Sippican Electric Floor Assembly (EFA). It is not a grid system. It consists of . . . flat metal sheets used as conductors installed in layers sandwiched between layers of wood. . . . The same conductors can be used for electrical and telephone connections. Access is gained by

pressing special receptacle units through the floor covering and into conductors at *any* desired location. The system is technically ready and operating in several installations. But according to supervisor of market research John Sawyer, it won't be marketed until 1977."

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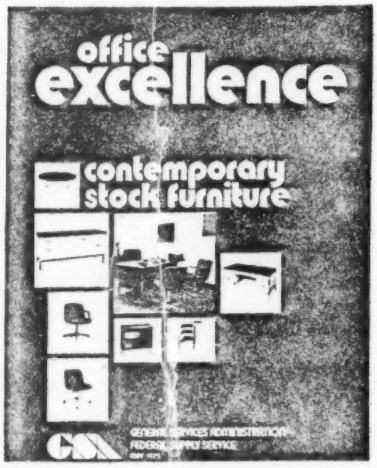


The Office Excellence catalog presents GSA's main line of office furniture. Other items can be ordered on Federal Supply Schedules or can be obtained through individual procurements.

New breed of designers

In the *AIA Journal* (October 1974), Donald Canty asserts that "office landscaping is the wave of the future. [But landscaping] or no, a satisfying . . . interior environment is not something that can be ordered from a . . . catalogue."

Successful use of the new approaches to office design requires the help of a new kind of professional —one who commands full, current, expert knowledge of *all* elements of office design—and one who is able to analyze and respond to the *essential* needs of his client. A few such specialists are coming to the fore in Government and in private practice. But, to find and properly support the right designer for his office, the top administrator and his staff must be—or learn to be—wise, knowledgeable, demanding clients.

Such clients will insist that the designer: • Never lose sight of the main goal of getting more work done more easily in wholesome, healthy surroundings while holding life-cycle costs to the minimum. • Recommend against change when it is not really desirable. • Make the fullest feasible use of existing space and facilities. • Plan for orderly, economical, graceful transition from the old approach to the new. • Advise and assist in obtaining the components and systems best suited to the long-range needs of the "new" office without being placed at the mercy of a single manufacturer.

Keen interest of top management

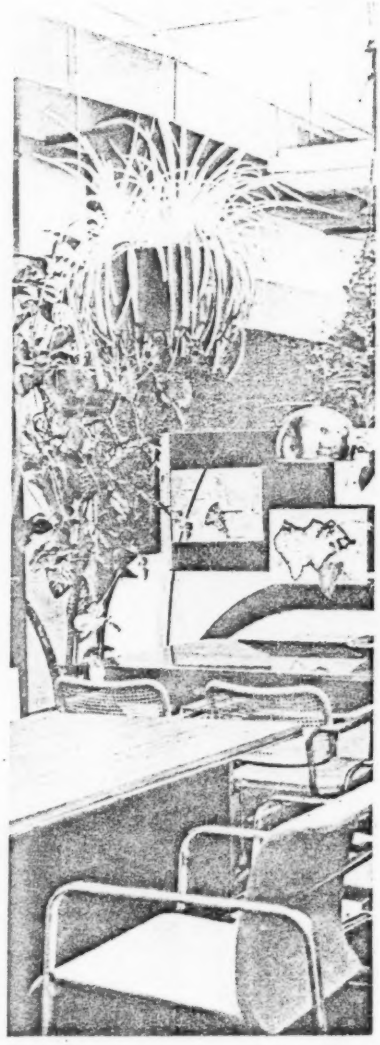
Top quality design seldom "happens" unless it is insisted upon by top management. In the field of office design, this has been the case in such agencies as the: • Office of Senator Mark Hatfield. • U.S. Park Service Design Center, Harper's Ferry, W. Va. • Seattle Regional Offices of the Federal Aviation Administration. • Offices of the Inter-American Foundation, Rosslyn, Va. • Office of the Comptroller of the Currency, Washington, D.C.

Yet, most Federal agencies are losing out on the benefits of good design because top management is so often preoccupied with "other problems." Too often an agency's design responsibility is left to someone who doesn't know "where to begin" to tackle the design problems that face him at every turn.

Bill N. Lacy, A.I.A., Program Director, Architecture+Environmental Arts, National Endowment for the Arts, recently restated his belief that "the overall design effort of a Federal agency is too crucial a responsibility to be handled on an ad hoc basis or as just one more additional duty." He sees sustained progress in Federal design beginning when "each agency installs a Counsel on Design and Communication to advise the top administrator on matters of design in much the same way that the General Counsel advises on matters of law. Such a professional would advise on: architecture, site planning and landscaping, workflow, communication, and space planning, decor, graphics and all other design aspects of the agency's communication effort.

"Once Federal agencies have such professionals, they should meet periodically to assess progress and recommend design measures that will help the Government to upgrade its performance. In the meantime, the recent advances in office design are so compelling that no top administrator should wait to take advantage of them."

E&S



This article is reprinted with permission from the October 1975 issue of **Federal Design Matters**, National Endowment for the Arts, Washington DC.

Directorate of Engineering and Services

Current Emphasis

brief commentary on significant developments

AUSTERITY IN CALENDAR YEAR 1976--From Programs Division at Headquarters comes the news that austerity will be THE word during Calendar Year 1976.

ENVIRONMENTAL IMPACT ASSESSMENTS/STATEMENTS--The two most critical sections of these documents are the ones which discuss the probable impacts and the alternatives. The latter section often does not discuss the environmental costs and benefits of each alternative. While it need not be as comprehensive as the prime action discussion, it must provide sufficient information to the decision maker to permit a meaningful selection of the best option, operationally, economically and environmentally.

FY 1976 MCP CONTRACT AWARD GOALS--The Air Force has again established ambitious goals for placing the Military Construction Program under contract: 75% of the program by 30 June 1976 and 100% by 31 December 1976. These goals are established in keeping with the DoD effort to avoid unnecessary cost growth inherent in untimely contract awards.

RETENTION OF MILITARY FAMILY HOUSING--In December 1975, Air Force initiated a test program to allow retention of military family housing by dependents of sponsors selected to serve unaccompanied overseas tours. The program is limited to bases within the United States (excluding Alaska) and if the results are favorable, consideration will be given to incorporating this provision into Air Force housing assignment policy.

FOLLOW-ON ASSIGNMENTS--PALACE BLUEPRINT is placing increasing emphasis on follow-on assignments for officers selected for remote assignments. Officers who are remote eligible and/or a volunteer for a remote should insure their AF Form 90 reflects their choice for a remote, for a follow-on assignment and current duty phone. PALACE BLUEPRINT will contact officers concerning their follow-on assignment and whether they intend to relocate their families and/or volunteer for a consecutive oversea tour. Contact PALACE BLUEPRINT at 487-3451.

PAVEMENT MANAGEMENT SYSTEM--AFCEC is developing a Pavement Management System which includes an improved method for conducting condition surveys. Personnel are requested to cooperate fully with the contractor (CERL) if a base is chosen for study of current maintenance procedures and for demonstration of the new survey method.

TRAINING FACILITY REQUIREMENTS--The results of an Air Force wide survey of training facility assets and requirements involving over 10 million square feet of building space are now being analyzed. The survey reports provide data that will support the establishment of requirements criteria and category codes (AFM 86-2) for a variety of command-unique and standard facility requirements that have long been inadequately identified. (continued next page)

JOB LIST FOR SERVICES OFFICERS--Services officers who did not receive the initial Job List dated 3 November 1975 due to mailing difficulties, may get a copy by writing AFMPC/DPMROS1E, Randolph AFB TX 78148, or by calling AUTOVON 487-4021.

CIVIL ENGINEERING SCHOOL ANNOUNCEMENTS--Because of required revisions, Preparation of Environmental Assessments/Statements Tele-Teach and the Environmental On-Site Seminar will not be available until FY 1977, 1 October 1976. *****Potential students for the Mechanical Engineering Course for Supervisors and the Electrical Engineering Course for Supervisors are primarily those personnel who have neither undergraduate education nor experience in the mechanical or electrical engineering disciplines. Interested personnel may apply through their MAJCOM training office.

BUREAU OF MINES' BOILER WATER TREATMENT PROGRAM--Recent information indicates less than 10% of Air Force bases world wide are participating in the Bureau of Mines' boiler water treatment program, and 70% of those who have participated have inadequate treatment. Through this program, savings of several times the cost of treatment can be realized in both fuel economy and in prevention of equipment losses due to corrosion.

FAMILY HOUSING IMPROVEMENT PROGRAM--During Calendar Year 1975, BCEs had awarded improvement projects totaling over $37.4 million. Upon completion of these much needed improvements, over 4,500 Air Force families will be provided homes that contain amenities and livability features commonly found in housing built by private industry for the civilian economy. Remaining FY 1975 funds in the amount of $15.6 million will be used to award additional contracts, in the near future, for family housing improvements for another 1,126 Air Force families.

FIBERGLASS FUEL STORAGE TANKS AUTHORIZED TO 20,000 GALLONS--ALMAJCOM letter, 6 November 1975, authorizes new and replacement underground storage tanks of glass fiber reinforced plastic construction in conformance with Specification MIL-T-52777. Criteria will be reflected in the next revision to AFM 88-15.

BIRD-AIRCRAFT STRIKE HAZARD (BASH)--The BASH team is now an integral part of the AFCEC. Ecological survey assistance is provided to installations experiencing bird problems in the aerodrome environment. The BASH team is the Air Force focal point for control of avian pests hazardous to aircraft. Questions should be directed to AFCEC/EV, Tyndall AFB, Florida, or call AUTOVON 970-2519.

COMPACT REFRIGERATORS--GSA awarded a new national term contract for compact refrigerators effective 1 December 1975. These small units, which range in size from four to six cubic feet, are now a standard item in all bachelor housing facilities. Unit prices range from $139 to $149, depending on location. All MAJCOMs are advised of this information in AF/PREN message 032300 Z December 1975.

FY 1977 MCP DESIGN GOALS--Headquarters has established design completion goals for FY 1977 MCP: 75% by 1 September 1976 and 100% by 15 October 1976. Initial design authority was issued a full four months ahead of previous schedules. Attainment of these goals will make the FY 1977 program ready for advertisement early in the new fiscal year which begins on 1 October 1976.

MOBILE EMISSIONS LABORATORY-(MEL)--is currently gathering turbine engine emission data at Air Force bases. The MEL is equipped with advanced air pollution measurement systems and will find future uses in measuring air pollution sources which are incompatible with standard EPA methods.

PROMOTIONS

Good news in the area of promotions for civil engineering and services personnel occurred during the month of December. Two civil engineering colonels were named for promotion to brigadier general; 40 civil engineering lieutenant colonels were selected for promotion to colonel; and 43 civil engineers and five services captains were chosen for promotion to major.

Brigadier general selectees are Col Paul T. Hartung, DCS/Engineering and Services, Headquarters Military Airlift Command, Scott AFB, Illinois, and Col Clifton D. Wright, Jr., DCS/Engineering and Services, Headquarters Strategic Air Command, Offutt AFB, Nebraska.

The new 40 engineering colonel selectees include

PRIMARY ZONE

Jimmie O. Atchley
Gerald E. Bond
Charles B. Conover
Earl S. Doderer
George F. Francis
Maurice R. Harlan
James N. Hicks, Jr.
Richard B. Kent
Duane E. Knutson
David A. Korzep
Earl L. Krueger
William C. Martin
Raymond E. McFarlane
John D. Pearman
Dallas H. Pope
John J. Reding
Sumner S. Sachs
Elton D. Scheideman
Richard E. Scrafford
William M. Shaw, Jr.
Leo E. Sheehan, Jr.
Ernest D. Strait
George R. Tate
Howard E. Tefft
George G. Tuttle
James G. Willett
Kenneth E. Yancey, Jr.
Bobby G. Yow

SECONDARY ZONE

George A. Bohlen
Benny M. Carr
Douglas M. Clements
David M. Cornell
Roy M. Goodwin
Harry E. Halac
Jarrell S. Mitchell
George F. Myers
Herbert D. Paul
George L. Rutland, Jr.
George J. Thomas, Jr.
Hisao Yamada

Some general characteristics of the colonel selectees include: All have completed senior services schools and are registered Professional Engineers. Also, almost three-fourths possess a master's degree.

Officers promoted below-the-zone had an even higher Professional Military Education (PME) completion rate (all at least Intermediate Service School—Air Command and Staff College (AC & SC) and three-fourths had either Industrial College of the Armed Forces or Air War College). The majority had been Base Civil Engineers and most possessed a master's degree.

The 43 engineering and five services major selectees are

PRIMARY ZONE

Jack W. Barbeau *
Jack D. Bell
Micheal B. Bergeson
Rollin C. Broughton, Jr.
William J. Brown *
Thomas E. Capps
Virgil J. Carr, Jr.
Robert F. Cauley
John A. Centrone
James I. Clark
Richard Coullahan
Thomas H. Eikerenkotter
William L. Foli
Robert R. Fiebig, Jr.
Eldon G. Franklin
Thomas W. Gorges
Robert R. Grant
John J. Gratton
Bradford C. Grems, III
Robert B. Harper, III
Howard J. Holdsclaw, Jr.
Joseph B. Hooten
Gary L. Hussey *
Kevin A. Kolz
Gareth F. Lacelle
Joe C. Lafoy, Jr.
Ronald M. Lebert
George E. Leftwich, III
William E. Leonhard, Jr.
Michael J. Lynch
Everett L. Mabry
David L. Miller
George H. Moeller
Robert S. Najaka
Richard L. Parrish
Joel G. Peterson
Anthony P. Pyrz
John M. Rahn
Larry I. Rank
Phillip T. Shealy *
Robert M. Sheppe
Robert F. Tafares *
Charles P. Turner, III
George A. Valente, Jr.
Charles B. Voss

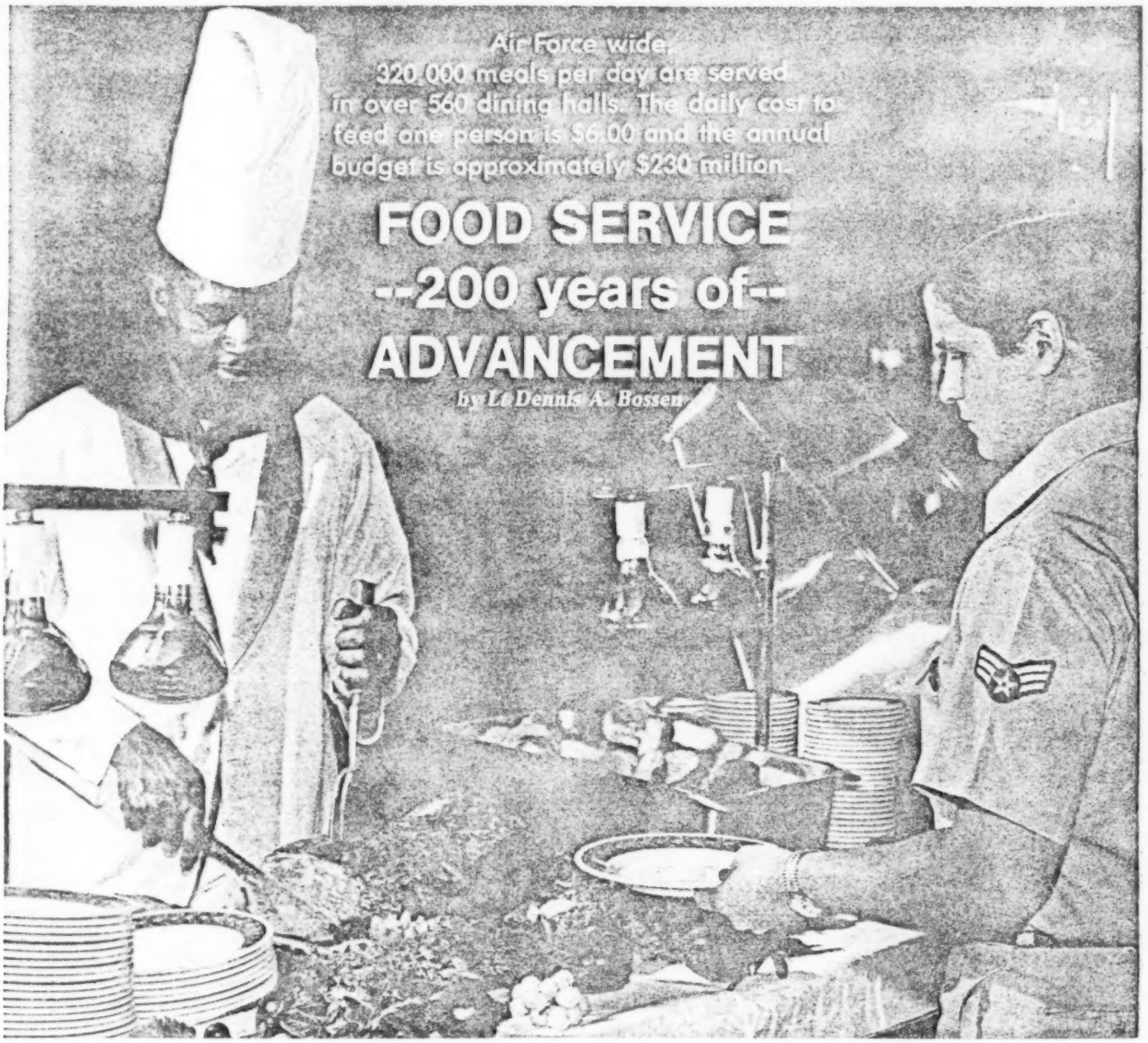
SECONDARY ZONE

Robert J. Courter, Jr.
Warren L. Page
Milton K. Tanaka

*Services Officers.

Some general, significant characteristics of the new engineering major selectees include: Almost all had SOS or AC & SC, two-thirds possessed a master's degree, three-fourths were nonrated, and the majority had or were presently assigned to a staff job (major air command or above). Only eight percent were registered Professional Engineers. The below-the-zone engineer major selectees all had either SOS or AC & SC (two-thirds had AC & SC), all have a master's degree and all have or are presently assigned to a major command or higher staff job.

The new services major selectees have SOS and the majority have AC & SC and a master's degree.


Air Force wide,
320,000 meals per day are served
in over 560 dining halls. The daily cost to
feed one person is $6.00 and the annual
budget is approximately $230 million.

FOOD SERVICE --200 years of-- ADVANCEMENT

by Lt Dennis A. Bossert

Although the importance of air power has been evident for almost 75 years, including the emergence of the Air Force in 1947, the history and concepts of US military food service go back 200 years, a bicentennial in itself. The fact that the soldier or airman must eat to fight or serve needs no explanation; but, how well they perform is greatly influenced by food service. The Continental Congress, on 4 November 1775, issued the following resolution concerning soldier's rations (the amount of food necessary for one person to subsist for one day):

"Resolved that a ration consists of the following kinds and quantities of provisions:

1. 1 pound beef, or 3/4 pound pork, or 1 pound salt fish.
2. 1 pound bread or flour.
3. 3 pints of peas or beans.
4. 1 pint milk.
5. ½ pint rice or indian meal.
6. 1 quart spruce beer or cider.
7. 9 gallons of molasses per 100 men per week.
8. 3 pounds of candles per 100 guards per week.
9. 24 pounds of soft or 8 pounds of hard soap per 100 men per week."

Often even these rations could not be provided.

The ration concept was changed later to a monetary allowance. For example, in 1932, the ration allowance for three meals was 35 cents; in 1952, it was 98 cents; and in 1971, it was $1.49. Today, the ration allowance is quickly overtaking the $3.00 figure. Food service personnel realize that the Air Force is well beyond the 1775 situation and the "mess kit" stages that followed. Great interest has developed in food service activities around the world. The recent surge in "people" programs was the basic cause of improvement and change. Other external forces such as inflation and technology tremendously influenced the path of food service. The Air Force is endeavoring to cope with these pressures and change by constantly reviewing mission assignments,

capabilities and resources; increasing its efforts to know its customers and their preferences, likes and dislikes; and continually reviewing its management system.

Sophisticated accounting and control systems, restaurant type dining halls with improved atmosphere, specialty foods and services, and new cooking equipment and procedures are rapidly taking their place in the Air Force. In the foreseeable future, assuming there are not major contingencies, costs will be the major factor affecting operations. Several studies have been completed or are on the verge of completion. These studies, such as the recent Basic Allowance for Subsistence (BAS) / a la carte at Shaw AFB, North Carolina and Loring AFB, Maine, will help plot the future. Substantial changes in the desires and in the financial situations of airmen have directed moves to new meal patterns, new food, new facilities and operational concepts. Some of these include quick service modules, flight line unit feeding, specialty and short order programs. The daily ration system with which we have lived since our inception as an Air Force is likely to give way to a BAS / a la carte system such as found generally in industry today.

Continuing efforts are being made to achieve a higher degree of productivity with better equipment, labor saving foods, contract feeding, and upgrading the quality of food service personnel through formal training. Serious evaluations of the methods of procuring equipment, subsistence and supplies are being made with the anticipation of reducing long range costs.

One might ask "What is food service doing to cope with these needs and pressures?" Several studies appear to point out some possible avenues.

- The food service structure must be continually reviewed to insure that it can support wartime contingency needs.

- Food service must know its customers, not only who they are, but what they want (a very fluid premise in these days of fads and crazes).

- Food service must continually survey methods of managing the materials of the system. These include people, facilities, food, equipment and the processes of acquiring them.

Before discussing current studies and avenues of change and improvement, it may be important to describe where food service is today and how complex any changes are. Air Force wide, there are about 750 food activities of which over 560 are dining halls. The remaining facilities include in-flight kitchens, crash and alert facilities, pastry kitchens and central preparation facilities. The numbers of personnel being fed at a single meal vary from as few as two or three to as many as 4,000. Food service consists of some 11,000 people, about half military and half civilian. This does not include contractor employees. The average daily cost to feed a person is approximately $6.00. Food and labor take up most of this cost with service, supplies, equipment, utilities and maintenance consuming the remainder (costs of facilities are not included). Food service feeds over 320,000 meals per day which adds up to an annual budget of approximately $230 million.

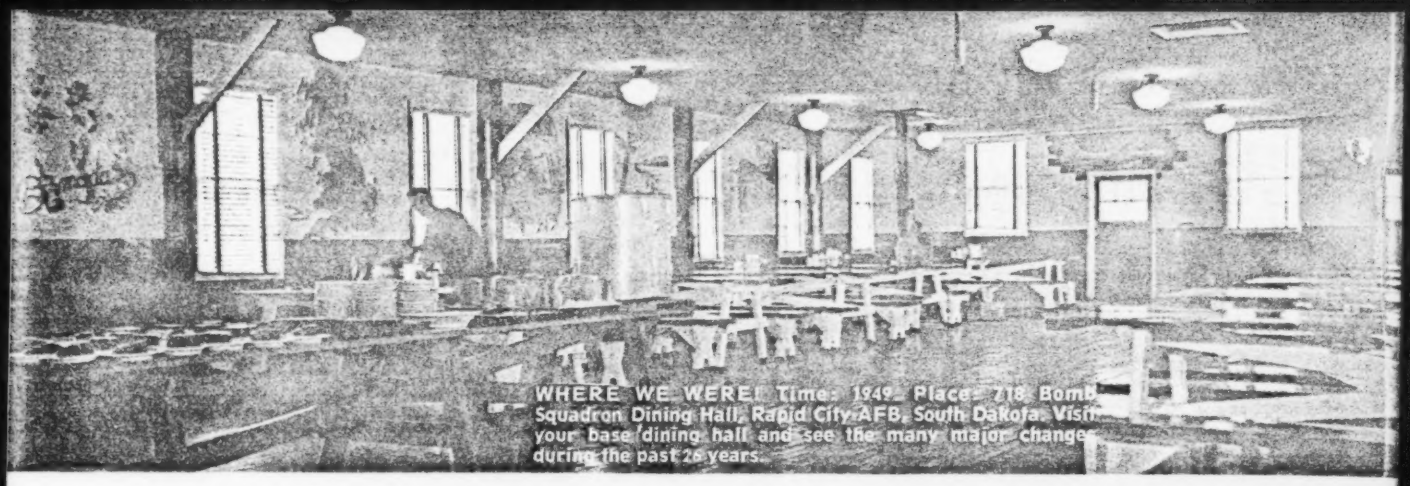
In addition to the various tests and studies, a strong program to motivate and encourage high performance in food service activities is ongoing. During the 1950s when the services were having typical postwar problems, President Eisenhower appointed former President Hoover to head a commission to study government reforms. President Eisenhower selected John L. Hennessy to serve on the commission subcommittee to improve troop feeding. Because of his inspiration, motivation and contribution to this study, an interbase food services competition was initiated in 1957 in honor of Hennessy.

The National Restaurant Association (NRA), National Industrial Cafeteria Managers Association and Food Service Executives Association have cosponsored the Hennessy competition from the beginning. In this way, leaders of the food industry have contributed in motivating and encouraging improvements in Air Force food services. The need for improved facilities, equipment and training of personnel has been brought to the attention of Base Commanders and the Air Force dining hall patrons have all become "winners." Each year the sponsoring organizations choose four masters of the food profession to represent them in judging the bases which have been nominated as "the best" within their respective command. These four members, along with the two representatives from the Air Force Services Office, are formed into two evaluation teams. One team judges the single unit dining hall entries; the second judges the multi-unit dining hall entries. The operations of these professional food representatives are recognized at the annual Chicago NRA-hosted ceremony by the presentation of trophies and plaques.

In the 19 years since they were first inaugurated, the Air Force Hennessy Awards have served to recognize and commend those Air Force bases which excel in management, preparation and service of food to their personnel. The competition and the awards were established to accomplish three essential purposes:

- To improve food service preparation, serving techniques, sanitation and management throughout the Air Force. The military departments buy only quality food, but all too often this was not apparent when the food was served to enlisted personnel. The annual competition now serves as one of the Air Force's primary motivation tools to improve food service for its airmen. Of course, the key to the success in this area is not only the internal management of food service, but also the degree of support received by the civil engineer and other staff agencies.

- Presentation of the award and the resultant publicity help raise and maintain the morale of food



WHERE WE WERE! Time: 1949. Place: 718 Bomb Squadron Dining Hall, Rapid City AFB, South Dakota. Visit your base dining hall and see the many major changes during the past 26 years.

service personnel performing what, in many cases, is considered a distasteful, non-volunteer chore, far removed from the so-called Air Force "flying glamour." When coupled with a nationwide food industry attempt to raise the prestige of food service employees, the Hennessy competition becomes even more significant in its overall competition.

• The spirit of competition motivates the development and training of skilled Air Force food service personnel. The Air Force learned long ago that good food service can only be obtained through a well-established system which makes use of competent and trained personnel. And if, in fact, the Air Force is to continue "doing more with less" under an increasingly stringent economy, all means must be used to reduce the feeding costs without sacrificing food service excellence.

The younger generation today likes its food fast, informal, irregular and cheaper. Representative of recent efforts to meet these preferences are the tests that have been conducted at Travis AFB, California. US Army Natick Development Center, functioning under the DOD RDT & E program, developed and monitored the Travis AFB study. One phase included renovation of the dining facilities to test the hypothesis that interior decor renovations improve consumer satisfaction. Another phase included the installation of a modular fast food service operation. A unit was located convenient to the dormitory area, offered popular foods prepared to order for takeout and was open over extended periods. A third phase included a flight line facility in the maintenance area that provided pre-cooked foods on a self-service basis for takeout.

Another test, initiated in January 1975, is the BAS / a la carte system at Loring AFB. Under this system, airmen receive their subsistence allowance and then pay the individual item price for whatever food they want instead of paying the whole meal price. Of course, this gives them freedom to choose where they want to eat. The system eliminates many irritants and problems associated with the present system. It requires better inventory control, provides better management and budget control, and shifts more of the responsibility to the individual to feed and care for himself. The major distinction between the Loring AFB test and the prior Shaw AFB test is that at Loring AFB there has been no major renovation, or equipment and staffing investments. The success of the test is obvious by talking to both diners and the food service personnel.

The last of the studies to be discussed is the February 1975 Homestead AFB, Florida carousel test. The food service staff, in conjunction with other base agencies, installed a Circle Serve (CS12) food line. The Homestead AFB "carousel" unit was placed in the newly renovated Blue Room (Dining Hall No. 3). It was purchased from a civilian company for approximately $47,000 and was installed in an unused dishwashing room (which was converted to a kitchen). It is supported by a beverage line and cashier. The unit requires two or three people to supply it from the kitchen side and generally handles over 10 customers per minute. The 12 foot diameter machine rotates about once a minute, giving the individual a chance to see and choose from a variety of foods while standing at one of eight stations. The unit is located in a wall cutout, part of it being in the kitchen, where it is supplied, and part of it being in the serving area. Base officials report good results so far with the machine, the only one of its kind in the Air Force. Full reports are not in yet, but to date the study is progressing satisfactorily. The results of these and other studies are still being analyzed and applied to further improvements in Air Force dining facilities.

Vital to successful food operations is a continuation of the desire to provide the best service possible. This is being accomplished where there is a concerted team effort between Food Service and the other base organizations it is supporting and being supported by.

E&S

LIEUTENANT BOSSEN *is the Chief, US Air Force Food Management Assistance Team, Air Force Services Office, Defense Personnel Support Center, Philadelphia, Pennsylvania. He is a graduate of Colorado State University with a bachelor's degree in management and has been associated with the Air Force for the past eight years.*

Worth Noting

1840 Civil Engineering Squadron Presented Citation of Honor

Lt Col A. R. Trautmann, Commander of the 1840 CES, accepts plaque from Air Force Association's Joe L. Shosid.

The 1840 Civil Engineering Squadron (CES), Richards-Gebaur AFB, Missouri was presented a Citation of Honor by the Air Force Association (AFA) at its annual meeting in Washington DC recently. Lt Col Albert R. Trautmann, commander of the Squadron, accepted the award on behalf of members of the 1840 CES.

The Squadron was cited for its mutual aid responses in assisting Kansas City firefighters in controlling two devastating off-base fires, training of local community firemen, and conducting tours for area schools.

Commissary, Clothing Store Award Winners Announced

For the second year in a row, the Barksdale AFB, Louisiana commissary has been named the winner of the L. Mendel Rivers Award as the best in overall operation in the Air Force. The Norton AFB, California commissary captured second place and third place honors went to the Yokota AB, Japan commissary.

The awards were presented to representatives from the bases at the American Logistics Association Convention in Washington DC in November. The Association sponsors the awards which are presented on an annual basis.

Concurrently, the Air Force announced the winners in its annual competition for the Outstanding Services Manager of the Year Award and the Outstanding Clothing Store Award. Winners included:

Maj John J. Maloney, Chief of Services, 2750 Air Base Wing, Wright-Patterson AFB, Ohio: **Senior Manager Award.**

Capt Patrick J. Demerath, 6987 Air Base Squadron, Shu Lin Kou AS, Taiwan: **Junior Manager Award.**

CMSgt Anthony Pannelli, 3201 Air Base Group, Eglin AFB, Florida: **Superintendent Award.**

SSgt Grover C. Worsham, 3rd Combat Support Group, Clark AB, Philippines: **Services Technician Award.**

Wright-Patterson AFB, Ohio was named the winner in the competition for the Outstanding Clothing Store Award. Vance AFB, Oklahoma was runner-up and Hickam AFB, Hawaii and Nellis AFB, Nevada were named second runners-up.

ANG Civil Engineer Association Names Texas Engineer President

Lt Col Harold H. Blackshear was installed as president of the Civil Engineer Association of the Air National Guard at its annual conference in St. Louis, Missouri recently. He presently commands the 149th Civil Engineer Group, Texas Air National Guard, Kelly AFB, Texas.

The approximately 400 member Civil Engineer Association meets annually in a four day seminar to discuss current Guard policies and missions. The 92 Air Guard engineer units from across the nation operate, provide and maintain facilities on a worldwide basis.

EWI Program Currently Being Established for Services Officers

An Air Force Institute of Technology (AFIT / Education with Industry (EWI) program is presently being established for the Services career field. Three immediate opportunities are anticipated during the Fall of 1976. Industries under consideration include Food Service and Retail Merchandising (supermarket and department store).

Officers selected to participate in this 10 month program will receive follow-on assignments which allow maximum application of the training toward the goal of providing the best possible service to the Air Force community.

Application procedures are outlined in **AFM 50-5**, Volume 1, paragraph 4-9, and the training description will be published in Volume 2, paragraph 4-20. Specific details will be available from the AFIT / EWI coordinator, Maj Andy Bakos, AUTOVON 785-3151, when the program is firmly established. Officers interested in the program may also call the Military Personnel Center, (Capt Nathan L. Pack) at AUTOVON 487-4021.

Got a problem with "hot spots" in your overhead electrical distribution lines? Look into . . .

infrared scanning techniques

by Don Lyne

The concept of using infrared (IR) scanning techniques to locate hot spots on electric utility systems was first investigated in 1964 when the Swedish State Power Board set up a joint project with AGA Infrared Systems of Sweden. Since that time, this method of prevention maintenance has spread to 17 other countries, including the United States.

Based on the principle that every object emits IR radiation proportional to its temperature, variations in the temperature of a surface as small as 0.2 degrees Centigrade can be detected. These variations from normal temperature can be seen as lighter or darker areas on a real-time thermal picture. This means that deviations from normal temperature can be detected at a distance and it is this advantage that the technique exploits.

The electromagnetic spectrum is divided more or less arbitrarily into a number of wavelength regions, called "bands," distinguished by the methods utilized to produce and detect the radiation. There is no fundamental difference between radiation in the different bands of the electromagnetic spectrum and they are all governed by the same laws. The only differences are those due to the differences in wavelengths. Thermography makes use of the IR spectral band. At the short-wavelength end, the boundary lies at the limit of visual perception, in the deep red. At the long-wavelength end, it merges with the "microwave" radio wavelengths in the millimeter range.

A new portable, lightweight model scanner system has been introduced that will make it more convenient to locate potential trouble spots in vaults and other space-limited areas.

The basic Thermovision system sells for approximately $30,000 and can be rented monthly for approximately $2,400. Some utilities own their own system but most use the services of a contractor.

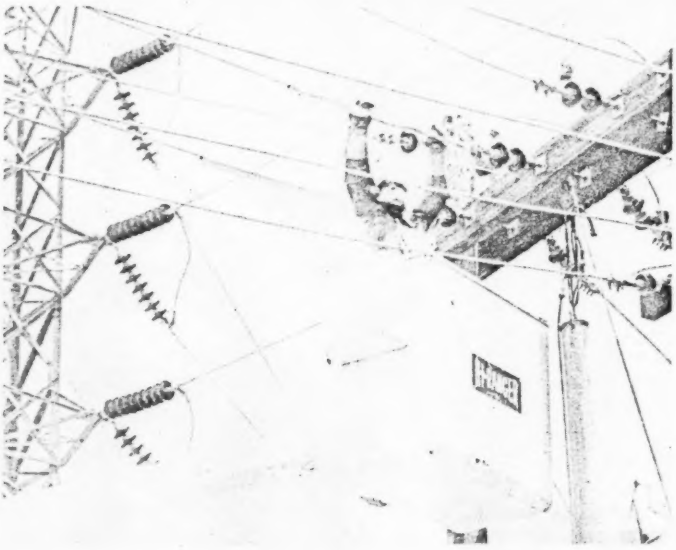
Asplundh Aviation Inc. introduced IR scanning in the United States after successful thermal-inspection tests on equipment at Texas A&M University's Electric Power Institute in 1967.

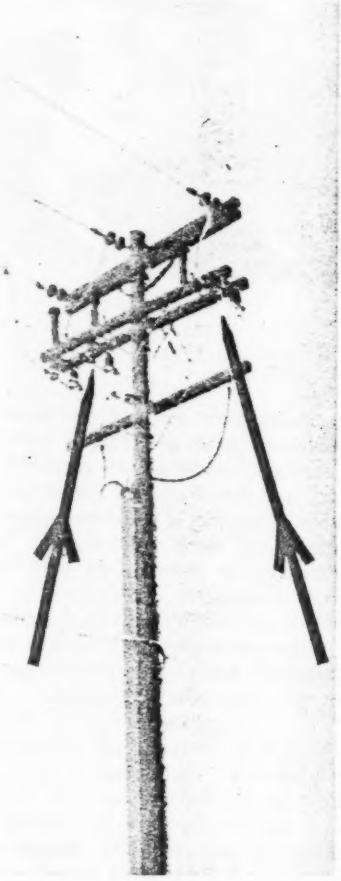
The scanning unit consists of a high-speed IR camera mounted on a periscope arrangement which protrudes through the roof of a small panel truck. The truck moves along a street at about 15 mph.

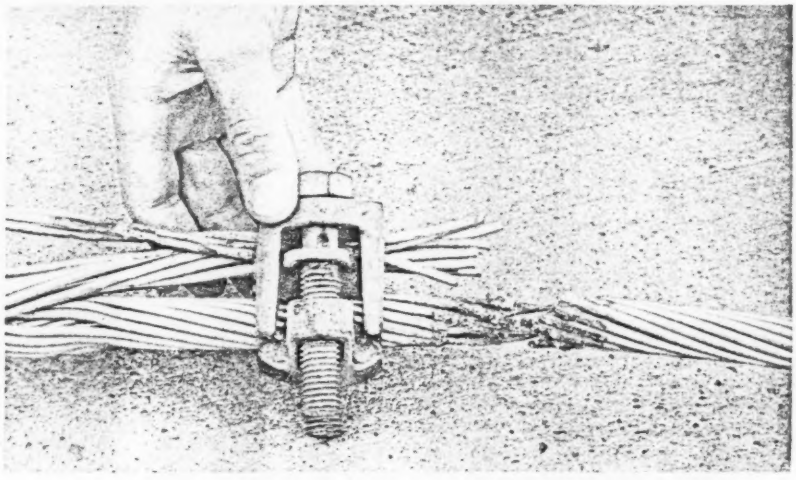
The IR camera measures the temperature of the electrical equipment being scanned and presents measurements in a continuous visual display on a cathode ray tube at the rate of four frames per second. With a capability of 21,375 temperature measurements per frame, temperature readings that indicate trouble spots can be recognized quickly and easily. Permanent records are obtained by an oscilloscope Polaroid camera which photographs the thermal and physical images.

Several Texas Electric Utility Companies have been using AGA Thermovision IR inspection equipment since 1968 with good results. One utility is even purchasing their own equipment.

The inspections are performed at two or three





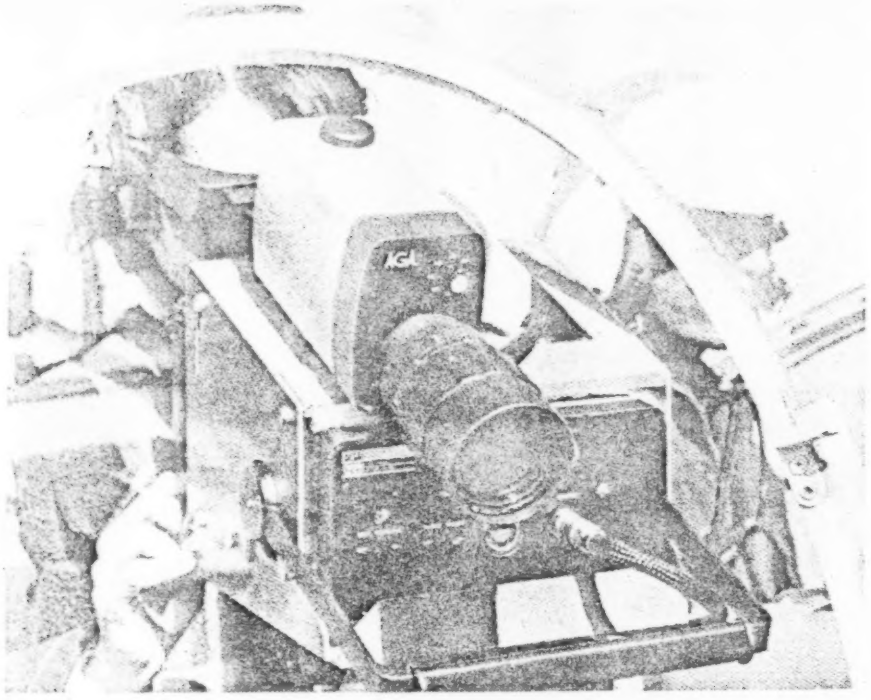


TOP: Lineman begins work to correct a problem identified by infrared scan.

CENTER: Results of a hot spot caused by loose bolted connector.

FAR LEFT: Actual photograph of riser pole. Arrows point to hot spot on switch.

BOTTOM: Distribution lines are checked using a vehicle with Infrared Scanning equipment mounted on roof. Almost 15-25 miles of distribution line can be checked per day using this method.



Flying about 100 feet off the top of power transmission lines, the Infrared Scanner equipment mounted in a helicopter can detect trouble spots at the rate of up to 200 miles per day.

year intervals for the transmission and distribution lines with substations being checked at one or two year intervals during peak load season. Transmission lines are usally checked with the use of a helicopter. The largest number of hot spots are usually found on bolted connectors, with hot spots on switches, compression connectors, splices and cutouts next in order of magnitude. Aluminum bolts on substation equipment have been found to stretch after a period of time and create loose connections. The number of hot spots caused by loose connections have been found to decrease significantly with the installation of compression type connectors.

Obviously, the greatest benefit of this system lies in correcting the causes, to reduce the number of hot spots that may occur in the future. To do this, the engineer or supervisor must make an accurate and complete identification of each hot spot and compare results from previous years' surveys.

As of now, the time of probable failure of a hot spot cannot be accurately predicted. More research must be done to determine the life of various components. For instance, if the part is massive, it may last for years, but a hot line-clamp may fail very quickly, since its heat sink capacity is small. As a general rule-of-thumb, hot spot value of 65 degrees Centigrade, or more above ambient, indicates the situation should be corrected on an emergency basis.

Sheppard AFB, Texas, obtained the services of an IR scanning contractor to survey the base substation and the overhead distribution lines (approximately 85,000 feet) last summer. The survey required one day at a cost of about $700 to the government. The contractor furnished a trained technician with a vehicle equipped with a Thermovision system and Sheppard AFB supplied an individual familiar with the electrical distribution system to drive the vehicle. At the end of the survey the contractor furnished the base with a notebook containing a photograph of each hot spot (both IR and actual), the location of the hot spot, the time the photographs were taken, the ambient temperature and the temperature of the hot spot above the ambient temperature. The contractor found the base's distribution system in overall good condition; only one faulty air switch and numerous loose connections were discovered.

Since Sheppard AFB's initial survey, Air Training Command (ATC) has made IR testing of primary distribution lines and equipment during peak load season mandatory on a three year cycle for all ATC bases. E&S

DON LYNE *is the Electrical Engineer at Sheppard AFB, Texas. He received his bachelor's degree in electrical engineering from Oklahoma State University. He has been associated with Sheppard AFB since 1972.*

COUNTERPOINTPOINT

Editor's Note: The opinions expressed in the following article are the author's own perceptions of the promotion system. The author is not connected with personnel, the Air Force Military Personnel Center or the Civil Engineering Career Management Team. Reader reaction is invited in the form of letters that do not exceed 200 words.

Articles published in this department provide engineers and services personnel with the means to openly discuss their ideas, controversial or otherwise, on how they can better perform their duties in Engineering and Services. Contributions are welcome but they should not exceed more than 600 words. Address your comments to the Editor, AFIT/DEJ, Wright-Patterson AFB, Ohio 45433.

A 50/50 Chance of Being Passed Over

In 1974, 54 out of 111 captains in the civil engineering career field were passed over in the primary zone for promotion to major. In 1973, the ratio was lower yet, and only **three** out of the 50 captains who were passed over, were promoted in 1974.

These statistics bring up several questions:

- Is this a continuing trend for civil engineering officers?
- Does this mean that a disproportionate amount of civil engineering officers are substandard performers?
- What is the problem?

I offer no stock answers. Rather, what I do offer are some experiences from my own background which may be beneficial to present junior civil engineering officers. You see, I was one of the non-selectees for promotion in 1974.

First, remember that the promotion program is based on the "Whole Man Concept." No matter what you accomplish, nothing is gained if it is not properly documented.

- Make sure all of your accomplishments are documented in both your Personnel Records and the Base Level Military Personnel System (BLMPS).
- Always compare your last year's BLMPS printout with your current one to ensure that nothing has been omitted.
- When a personnel official explains various BLMPS entries, listen intently - - assume nothing.
- Should you question a personnel official on why a certain technical course is not shown to your credit, do not accept obscure answers. Ask him to show you the BLMPS central tables listing for that particular DIN field. If he can't, ask to see his boss.

At the time the promotion board was considering my promotion, in the primary zone, I asked the CBPO Chief a question about my record. He responded with a question: Did I want him to personally review my records? I accepted eagerly.

Five minutes later, he asked me if I wanted it straight. I replied hesitantly in the affirmative. "Your chances for promotion this time around are practically nil," he said.

I was shocked.

He continued: "The only chance you have is that there are 12 months until the next board and here are the things you need to do if you are to have a chance the next time. At best, all I can say is a 50/50 chance is the max for you."

My first thought was: impossible. My second thought was: why hadn't I found this out earlier? **I realized that most of it was my own fault.**

There I am and here you are. What can be done to prevent this from happening to you? Here are my suggestions based on my experience.

- Encourage your supervisors to sit down with all their junior officers and go through their records. If at all possible, request that an experienced personnel officer be present who can give some indication of how each officer stacks up with his contemporaries.
- Suggest that a counseling session be required between the reporting official and the individual being rated to ensure that

1. No misunderstanding exists regarding the objectives of the supervisor and that of the subordinate.

2. Explanations are exact in what is expected of the subordinate to improve his rating.

3. The reporting official is completely aware of all accomplishments of the subordinate, especially those related to extra duties.

The supervisor who gives a reduced rating relative to prior Officers Effectiveness Ratings (OERs) must realize that this is particularly critical at the captain level, since it not only indicates a failure to improve but also regression. A supervisor should not do this without making the ratee aware of the impending consequences, and giving the ratee an opportunity to correct his deficiencies. At the captain level, it is too late to tell him at the time the OER is written.

Further, if it is the reporting or possibly an endorsing official's final decision to give a reduced rating, the ratee should be briefed on the critical effect of this action on his career. This provides the opportunity for improvement if the officer wants to take the initiative. Also, it makes everyone aware of the gravity of the situation, ensuring that the ratee either take immediate action to contest the rating if believed unjust, make significant personal improvements or prepare for separation.

I talked with several officers who did make it, including one who was

promoted to major three years below the zone, and I found certain things in common. In the case of the individual that made it below the zone, I found that it was no accident. He had an intricate timetable identifying annual professional, military and educational objectives from the day he pinned on the lieutenant bars. Some suggestions are as follows:

• Don't think of the records review program as another part of the Air Force bureaucracy, but rather, as one of the most important requirements of your career. It may cost you your career if you don't.

• Insure that your supervisor is aware of your accomplishments.

• Insure that you understand your supervisor's objectives, and strive to give him maximum support in reaching them.

• At the first note of discord between you and your supervisor, approach him in an effort to find a mutually acceptable solution, but remember he is the boss.

• In the event that you do get what you consider to be an unfair OER, take action to have it removed immediately. The longer you wait, the harder removal will be. Don't be lazy and think that one bad OER won't hurt. The one that is five or six years old could be the killer, especially as competition becomes more intense.

• Set up your professional objectives as early as possible, and continually update them. Don't just shoot for minimum qualifications. The standards you shoot for as a second lieutenant may not be adequate 10 years later.

• Tell your boss that you are after that top OER and if, at any time, you are not meeting the requirements, you want to know about it and then ensure you get continuous feedback. This makes the boss do his job but **you must be prepared to perform.** A continual outstanding performance is the key to a below the zone promotion, especially under the new OER system.

• First, last and always, no matter what you have accomplished, if it is not in your personal records or in the automated BLMPS, it is of naught.

Let's take a look at "real life" civil engineering. There is probably no other career field in the Air Force as challenging and complex as civil engineering. It is so complex, few outsiders can even begin to comprehend your problems. You have a city to keep operational and hundreds of thousands of dollars to manage. Probably as a group, no one puts in more manhours per day or works harder with fewer resources than civil engineers.

I've said all of this to point out: **it is an uphill climb and it's a hard field to look good in since you can only approach getting caught up.** Under the pressure that your Base Civil Engineer is experiencing, it is difficult for him to look rationally at you no matter how hard you are working. It is a rough business at best but if you and the boss get together, **you can win.**

There are many tricks to the trade but to sum it all up, here is the thing to do: **don't procrastinate because tomorrow may be too late!**

Remember, go to Squadron Officers School, get professionally registered, complete Command and Staff College, keep your boss informed, ensure that your records are up to date, get to work on that master's degree and continue on in an active professional and academic program. There are other things you can do, too, but if you follow these recommendations, you will be on top of the pile when the dust clears.

Good luck!

Capt W. E. Thompson
APO New York 09293

Reader Response

The article by Major (Fred) Rochez on the IWP hit the nail on the head (November 1975 issue). Many hours are spent in formulating the plan and then few to none use it, or understand it.

There are many reasons for non-compliance that can be corrected internally or locally. The IWP is an outstanding management tool, that if used properly will not only save manhours and money, but will indicate to all managers at all levels, where weaknesses in supervision and management occur.

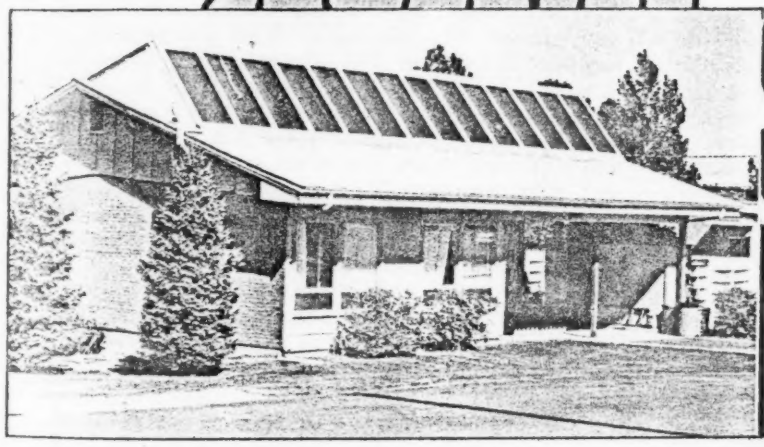
There are actions that must be taken by Base/Wing Commanders for the plan to work, such as, all personnel requesting work to be done must have an operating plan within their unit. They must know what work they want CE to do for the coming year. Commanders should realize that CE cannot respond to their needs immediately (unless emergency) due to lead time on material and available manhours.

All commanders must think six months in advance and submit their requirements accordingly. This can be corrected by Base/Wing Commanders. Internally, CE Commanders can understand BEAMS and insist all managers and supervisors do the same. Select qualified personnel as the IWP Programmer; one who has had experience in the shops as well as programs. Assign the IWP Programmer to a level of authority commensurate with other jobs such as superintendents. Conduct internal training programs for all managers and supervisors required to know the BEAMS system. Have the IWP keep a running report of all changes that affect the IWP and submit the report to BCE, Chief of O&M, Chief of Programs, in order for them to have collective information for management decisions. But above all make sure the IWP Programmer understands and uses all BEAMS products, coordinates his IWP products with applicable managers and supervisors and makes necessary changes to the IWP on a timely basis. Just changing the IWP to insure that hours come out correctly is not enough. Logical and well thought out changes by all responsible individuals will make the IWP meaningful and workable. What Major Rochez suggested regarding separate managers for each area such as service call recurring maintenance program, etc. will be controlled if the IWP is prepared correctly and the IWP Programmer is on the ball. Air Force should set standards and grades for the IWP Programmer. Then and only then will we feel the full impact of the IWP.

Control of manhours, training programs, DE's insistence on managers understanding BEAMS, end of the month letter on deviations and lateral coordination between O&M and Programs have been instituted and have substantially improved the IWP at this base.

Frank Crocker
IWP Programmer
Keesler AFB, MS

AIR FORCE ACADEMY SOLAR ENERGY PROGRAM



The ability of Air Force engineers to pioneer has been established . . .

by Maj M. W. Nay, Jr, PE, LA, and Lt W. A. Tolbert

The US Air Force Academy (USAFA) became a victim of the energy crisis during the winter of 1972, approximately a year before it was a nationwide concern.

The primary source of thermal energy at the USAFA is natural gas which is purchased through the city of Colorado Springs. The natural gas that serves the family housing areas and the cadet dining hall is provided on an uninterruptible basis. The remainder of the base is heated by two large central heating plants which are provided natural gas on an interruptible basis.

Unfortunately, the USAFA's interruptible natural gas service was interrupted for 171 days (from December 1972 to May 1973) by the supplier, due to a shortage of natural gas. Fortunately, the boilers in the two central heating plants could be converted to burn fuel oil and they went on fuel oil for the duration of the service interruption. At the end of the fiscal year, the budgetary effect of this interruption was apparent. The unit BTU cost for fuel oil is greater than for natural gas. **Figure 1** reflects the costs that were incurred in FY 1973 as compared to those in FY 1972 resulting from the service interruption.

The unit cost of uninterruptible natural gas increased from $0.3957 per MCF (thousand cubic feet) to $0.4594 per MCF. When the 1975 heating year began on 1 October, the unit cost was $0.8380 per MCF. If Congress directs the Federal Power Commission to deregulate the price of natural gas, as is expected, and it seeks balance in the marketplace under predicted under-supply conditions, it is anticipated that the unit cost will drastically rise. The effect of this action on the Air Force operations and maintenance budget, as well as the general economy of the rest of the nation, needs little explanation.

Concerned by the significant rise in fuel costs, as well as the bleak energy supply future, USAFA officials initiated some significant recovery programs.

Figure 1: *Air Force Academy Fuel Consumption*

FY 1972		FY1973
	Uninterruptible Gas	
319,849 MCF		345,108 MCF
$126,568		$158,571
	Interruptible Gas	
1,209,891 MCF		568,451 MCF
$324,851		$165,442
	Fuel Oil	
140,240 gal		3,924,110 gal
$18,357		$599,809
$469,776 *Total*		*Total* $923,822

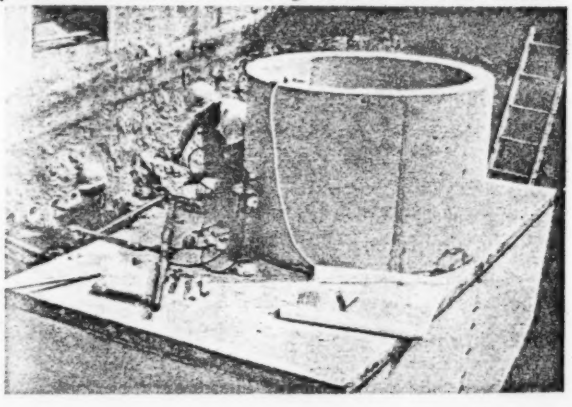
The programs included constructing a 1,500 barrel (63,000 gallon) fuel oil storage tank adjacent to central heating plant No. 1; implementing a significant energy conservation program that produced a 15 percent reduction in all energy consumed in FY 1974 compared with FY 1973; and beginning a serious investigation of developing alternate unconventional energy sources at the USAFA.

Of the alternate unconventional energy sources considered, solar energy was identified as having the greatest potential for use at the Academy. Lt Gen A. P. Clark, then Superintendent of the Academy, advised General John D. Ryan, then Air Force Chief of Staff, by letter, of the USAFA experience and advised him of the confidence in solar energy held by Academy personnel and offered the Academy as an Air Force demonstration site.

Shortly thereafter, an informal committee was developed which became known as the Air Force Solar Energy Working Group (Civil Engineering / Facilities). The committee was chaired by the Professor and Head of the Department of Civil Engineering, Engineering Mechanics and Materials at the USAFA and was comprised of engineers from Headquarters Air Force Civil Engineering, various Air Force Systems Command (AFSC) laboratories and the Academy. This committee, for the first time, considered the potential for using solar energy for the heating and cooling of Air Force real property. The justifications for such consideration were to help offset rising utility costs from conventional fossil fuels and to guarantee mission continuation in the face of a threatening energy crisis.

Initial work of the Air Force Solar Energy Working Group was involved with identifying ongoing work as well as recognizing Air Force resources and requirements. A significant amount of work was exerted in an attempt to obtain support for an applied research and development program at the USAFA. In this regard, proposals were prepared in the support of the National Energy R&D Program call in support of "Project Independence" and the

Workers assemble pipes during the installation of the precast concrete thermal storage tank for the Solar House.

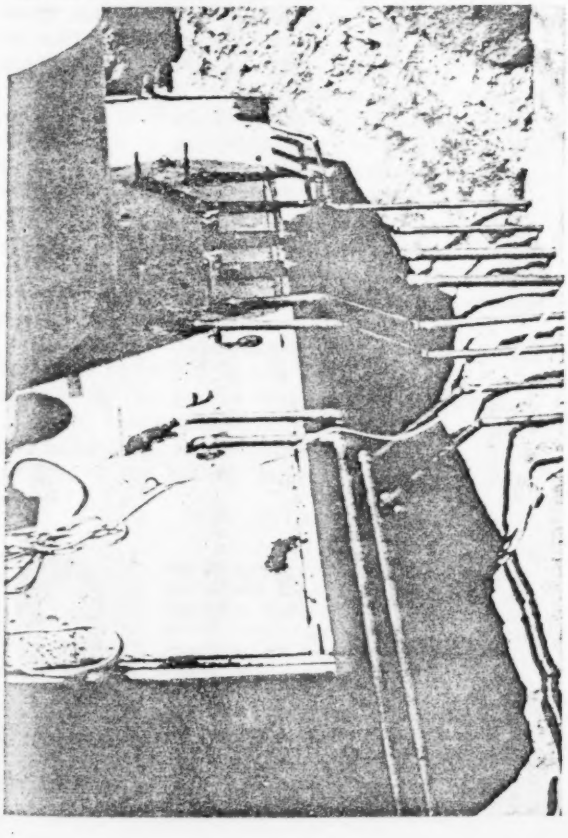


National Science Foundation's Research Applied to National Needs Program.

Although neither of these initial proposals resulted in a funded project, the in-house effort at the Academy continued at an increased pace. With the enthusiastic support of Lt Gen James R. Allen, Superintendent of the Academy, another proposal was prepared that dealt with retrofitting existing family housing. This proposal was approved by AFSC and Headquarters Air Force Civil Engineering in March 1975. The project represents a joint venture between the AFSC and the USAFA and is funded by the Air Force Aero Propulsion Laboratory at Wright-Patterson AFB, Ohio, through the Frank J. Seiler Research Laboratory, the AFSC tenant at the Academy. This project was completely designed in-house by Academy faculty and base civil engineers. It was constructed in part through a negotiated contract by Dan Howells & Sons, Colorado Springs, and in part by Base Civil Engineering personnel, and provided for retrofitting an existing single family military housing unit at the USAFA with commercial diffuse ray flat plate solar collectors for the primary purpose of space heating and the secondary purpose of domestic hot water pre-heating.

Two single family Capehart quarters are involved. Each has three bedrooms, two baths, a basement and carport. The living area in each house has 1,194 square feet and the unfinished basement has 708 square feet. The design heating load (—2° F outside temperature) for the quarters is 57,456 BTU / HR. One house, designated the Solar Test House, received the actual modification; the second house, designated the Solar Control House, has the same solar orientation as the Solar Test House, and is being operated in a conventional manner using natural gas alone for the furnace and hot water tank. The natural gas consumed, as well as interior temperatures, will be monitored. Thus, the Solar Control House serves as a performance reference for the Solar Test House during the test and evaluation phases.

A close-up view of the piping from the precast concrete thermal storage tank to the Solar Test House.



The modular commercial solar collectors manufactured by Revere Copper and Brass, Inc. are mounted in a split array, with half (273 square feet) the collectors mounted on a ground array located adjacent to the quarters, and half positioned on a roof array mounted atop the quarters. The ground array is so constructed that the angle of attack of the array to the sun can be changed. Water with ethylene glycol is being used to transfer the thermal energy collected from the solar collectors to a buried 2,500 gallon precast concrete storage tank via a series of heat exchangers located in the tank. The flow rate of the mixture of water and ethylene glycol through the solar collectors is a system variable that will be operated at different rates during the test and evaluation period.

The existing heating system in the quarters is a natural gas fired, forced hot air heating system. The solar energy system supplements the existing heating system by using a heat exchanger installed in the furnace supply plenum. It is programmed to operate in different modes depending on the temperature of the water in the buried thermal storage tank.

The system is currently programmed to operate in three modes: natural gas heating alone; solar heating alone; or a combination of the two. An Intellec 8 Mod 80 microprocessor with an ASR 33 teletype serves as the automated data processing unit for the quarters' instrumentation and control system. The majority of the instrumentation and control system was designed and installed by faculty members and technicians of the Academy's Department of Electrical Engineering. The key to activating the system, as programmed, is the temperature of the water in the thermal storage tank. This, in itself, is a variable and different resulting activating temperature differential values can be programmed, if necessary. Sufficient capacity with respect to input / output cards and memory chips exist with the microprocessor that parameter limits can be changed as required. Moreover, sufficient wet and dry temperature sensors have been carefully placed along the thermal collection and transfer system to allow the actual measurement of thermal transfer efficiencies. The signals from these temperature sensors are received by the microprocessor and recorded on the ASR 33 teletype.

In addition, a meteorological monitoring system

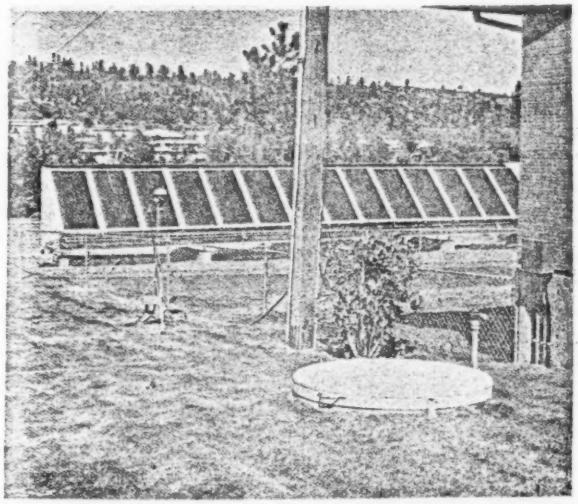
which includes a pyranometer for measuring solar insolation, (rate of solar radiation received per unit horizontal surface) as well as a unit for measuring wind speed and wind direction (TMQ 15), and a unit for measuring air temperature (TMQ 20) is located at the Solar Test House. The latter two items were provided by the Air Weather Service through the 12th Weather Squadron at nearby Ent AFB. This meteorological data is monitored constantly by the microprocessor system and recorded. Among the benefits to be gained by the meteorological monitoring system will be the ability to predict the performance of solar energy systems at other Air Force bases on the basis of comparison with other meteorological data, the ability to measure actual solar collector efficiencies and the ability to substantiate dynamic heat load determinations. The uniqueness of the particular project lies in its application to existing structures and its ability to directly compare roof mounted and ground mounted solar collector systems with respect to initial costs, operating efficiencies and maintenance costs.

On the basis of the description of the scope of work of this project, the Solar Test House should not be considered a prototype. Rather, because of the system redundancy as well as flexibility, it is an operating laboratory, supporting an applied research and development program. A three-year test and evaluation program is currently envisioned:

- During FY 1976, the goals are basically to make the system operational and to optimize the variables involved.
- In FY 1977, involvement will consist of the evaluation of other types of commercial solar collectors on the ground array and the investigation of building energy conservation concepts to include entry vestibuling, thermopaning and reinsulating to determine if the heating demand can be effectively lowered.
- In FY 1978, an investigation of photovoltaic systems is envisioned.

During the test and evaluation program, engineering officers and their families will live in the two houses.

There are many reasons for performing the field scale solar energy test and evaluation work at the USAFA. One important reason is the potential for the involvement of cadets with the program and the resulting immediate technology transfer to the operating Air Force. For the past few years, the Department of Civil Engineering, Engineering Mechanics and Materials has presented blocks of instruction on solar energy in a few advanced courses and has also conducted some design courses in which a flat plate solar collector and a parabolic solar collector were built and tested. This academic year a new course, entitled Solar Energy Applications, was developed and offered in the fall semester. For the spring semester, an additional design course will be offered that will directly involve cadets in the test and evaluation program at the Solar Test House.



Solar Ground Array at the Solar Test House with the meteorological monitoring tower and cover on the buried thermal tank.

The retrofit construction of the Solar Test House has many objectives, the most important of which is to develop baseline design criteria to support similar

MAJOR NAY *is the Principal Investigator of the USAFA Solar Energy Program. An Associate Professor and Chief of the Environmental Engineering Branch at the Academy, he received his bachelor's degree in civil engineering from Virginia Polytechnic Institute, his master's degree from Georgia Institute of Technology and his doctorate degree from VPI. He is a registered Professional Engineer in Colorado.*

LIEUTENANT TOLBERT *is an Associate Investigator of the USAFA Solar Energy Program and is the Chief of Resource Planning at the Academy. He received his bachelor's degree in civil engineering from the University of Wyoming and his master's degree in architectural engineering from the University of Texas. He is an Engineer-in-Training in Colorado.*

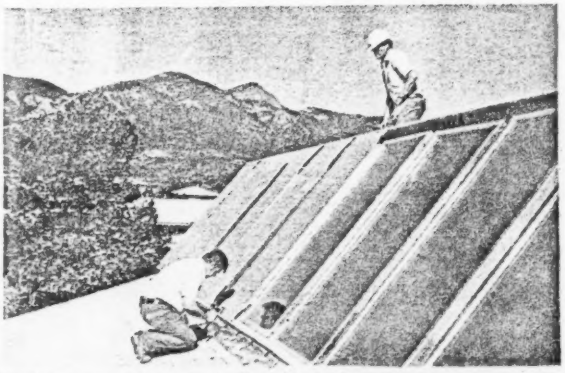
large scale Air Force projects in the future. Another is that the Academy is obtaining excellent practical experience in the design, construction and maintenance of solar energy systems. Also, meaningful cost data is being collected with respect to initial costs and operating and maintenance costs. The results of this first year of testing and evaluation, together with summaries of the design and construction phases, will be presented in a project technical report on or about 30 June 1976.

Looking to the future, Air Force Civil Engineers must begin considering alternate unconventional energy sources in order to offset rising utility costs from conventional fossil fuels and guarantee mission continuation as conventional fossil fuels become unavailable. Although solar energy will not solve all energy dilemmas, it does have an excellent potential which cannot be ignored.

As a result of the Solar Heating and Cooling Demonstration Act of 1974, numerous demonstration unit solar houses will be built in the next five years. Within the Department of Defense, 50 such family housing units will be built at various military installations within the next two years. These projects will provide invaluable information on the effectiveness of solar energy systems.

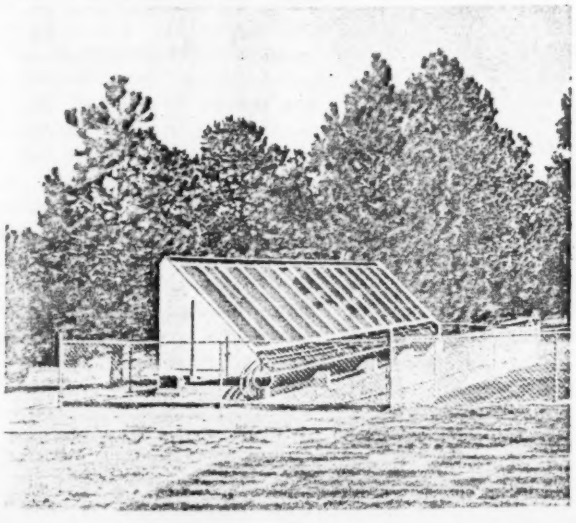
In the meantime, the Air Force Solar Energy Working Group (Civil Engineering / Facilities) having served its initial purpose, is now dissolved. In its place is the Headquarters US Air Force Solar Energy Task Force which is charged with the responsibility of developing criteria, establishing policy and administrating all Air Force solar energy projects that are real property oriented. In carrying out this mandate, the Task Force will issue periodic guidance letters to the field.

This project at the Academy is a prime example of the ability of Air Force engineers from two separate organizations, the Dean of Faculty and Base Civil Engineering, to unite their efforts and skills in establishing an applied solar energy research and development program. By conceiving, designing and constructing a project of this nature, the state-of-the-art in solar energy technology has been advanced and the ability of Air Force engineers to not only support, but to pioneer, has been established. The success of the growing Air Force Solar Energy Program is a responsibility that all Air Force Civil Engineers now share. E&S



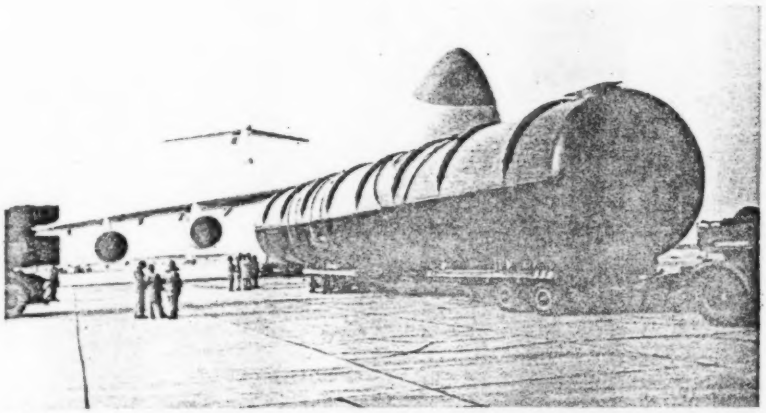
Workers are shown installing the solar collector panels on the roof array of the Solar Test House at the Academy.

The Solar Ground Array is shown at the Solar Test House. The flashings are removed to show plumbing.

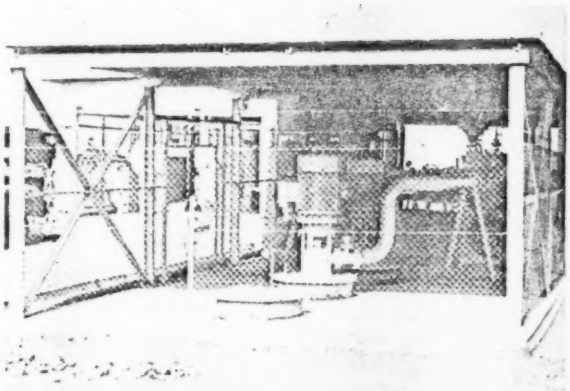


Lt W. A. Tolbert and his family will live in the Solar Test Home during the three year test-evaluation period.

Airlifting the largest fuel storage tank and biggest single piece of cargo ever transported in Air Force history was only one of the problems encountered by USAFE Civil Engineers in upgrading and completing a new...



80,000 gallon tank being prepared for loading on C-5 aircraft at Rhein Main AB.



Closeup view of completed installation of 80,000 gallon tank, with two, 1,200 gpm pumps in center of pumps.

The existing hydrant fueling system at Incirlik, Turkey, was built in 1952. Due to many years of operation and the surrounding corrosive environment in the area, many components in the "PANERO" design system were worn out and the frequency of breakdown was increasing. Changes in aircraft types from the early F-80 series to F-4 and subsequent deployment of Military Airlift Command's (MAC's) transport fleet of C-141 / C-5 aircraft have resulted in a 100 percent fuel load increase without significant system improvements.

An upgrading and alteration project was prepared for the existing fueling system at Apron F. Because of the urgency, normal programming under the Military Construction Program was not timely and funding in the P-341 category for the amount of $300,000 was requested. Design authority was obtained from Headquarters US Air Force in December 1972, and approval for construction was received in March 1973.

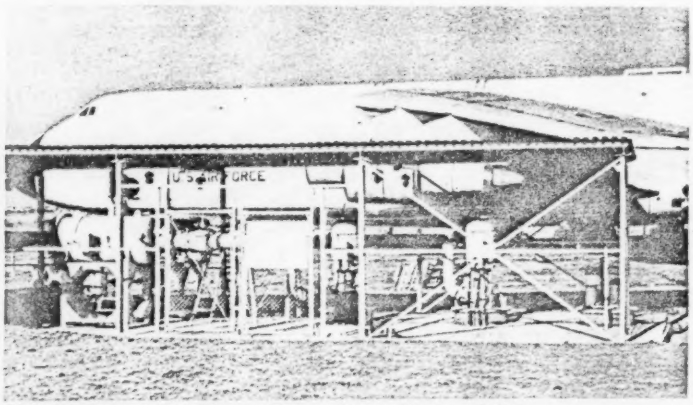
The scope of work consisted of one 80,000 gallon horizontal cylindrical steel tank, internally and externally coated, for underground installation; two 1,200 gpm fueling pumps with all necessary controls; two fueling positions with eight hydrant outlets each and 1,800 feet of 12 inch diameter aluminum pipeline loop connected between the storage tanks and the hydrant outlets. Plans and specifications were developed by Headquarters USAFE, Ramstein AB, Germany, using in-house engineering resources. Savings in design and construction supervision alone were $29,000, and the US Air Force design guidance for Pressurized Type Fueling Systems (Phillips Study) was incorporated.

Since there was no technical capability in Turkey for construction of this specialized fueling system, the project was advertised. The USAFE Procurement Center in Wiesbaden, Germany, awarded the contract to a qualified German firm for $284,000 to be paid in Deutsche Marks (DM) at a conversion rate of DM 2.83 per dollar. Devaluation and variations in the value of the dollar during the construction time suddenly created a problem; the statutory limitation of $300,000 could not be exceeded. Several items were deleted from the project to lower the cost without jeopardizing the functional capability.

The initial construction start at the work site in August 1973 was delayed until November 1973, eliminating interference with a planned NATO exercise. The first effort was by a USAFE in-house construction team with heavy construction equipment, airlifted from Ramstein AB, Germany. The responsibility of this team was to

High Speed Aircraft Fueling Project

by Walter Will



Overall view of the new fueling system with two, 1,200 gpm pumps.

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perform all structural work such as excavating the hole for the 80,000 gallon tank, pipeline trenching, including cutting of the 20 inch thick concrete apron, restoring the ramp, and construction of hydrant fueling pits.

The 80,000 gallon steel tank, which is 12½ feet in diameter by 90 feet long and weighs 79,800 pounds, was designed and constructed to fit into the cargo envelope of a C-5 aircraft, enabling air transportation from Germany to Incirlik. Alternative methods of shipment were considered but were shelved as unfeasible. Therefore, the tank was constructed at a steel plant outside of Frankfurt, Germany, and hauled to Rhein-Main AB, where it was internally and externally coated.

Special shipment preparations were made by Headquarters MAC. A team of experienced loadmasters was sent to Rhein-Main AB to supervise the on and off-loading operations of the tank. This was extraordinary, since it was the largest single piece of equipment ever transported by a C-5 aircraft. The on-loading at Rhein-Main AB took seven hours, the flight to Incirlik five hours, and the off-loading operations another six hours. A day later, the tank was scheduled for movement into the excavated 18 foot deep hole, but heavy rainfall the previous night made the entire construction area a large mudhole. In spite of the continuing rain and the very minimum of hoisting and lifting equipment, the tank was installed without incident. The installation was accomplished due to the combined efforts of the USAFE and contractor teams. Continuation of the heavy rain and non-availability of special equipment items from the United States and Germany resulted in a work stoppage in mid-December 1973. A second interruption occurred in May 1974, when a number of special aluminum fittings, adaptors and equipment was stolen. The project was completed, the system functionally tested and accepted in Oct 1974.

The joint Headquarters US Air Force / USAFE effort resulted in an early approval of the project by DOD. In-house design by USAFE insured timely completion of plans and specifications and resulted in a savings of $29,000. Special efforts by MAC made it possible to airlift the largest fuel storage tank and biggest single piece of cargo ever transported in Air Force history. The experiences gained from this operation should benefit similar future air movements. The technical skill and know-how of the USAFE in-house and the contractor's special teams assured that the High Speed Aircraft Fueling System is now working safely and satisfactorily, expediting construction and reducing costs.

E&S

Bulletins at Deadline

STOP THE PRESSES—While this issue was being printed, the announcement was made that Brig Gen Frank G. Barnes, DCS/ Engineering and Services, Headquarters Air Force Logistics Command, Wright-Patterson AFB, Ohio, was nominated for promotion to major general. Simultaneously, Brig Gen William D. Gilbert, Deputy Director, Directorate of Engineering and Services, Headquarters US Air Force, was named a permanent brigadier general.

Deadline for submittal of ideas for a new Engineering and Services seal has been extended. To date, only a few sketches have been received by the editorial staff of the QUARTERLY. Refer to the November 1975 issue for details. Think about it and then send in your ideas. Deadline now is 1 May 1976.

☆U.S. GOVERNMENT PRINTING OFFICE: 1976—657-650/2